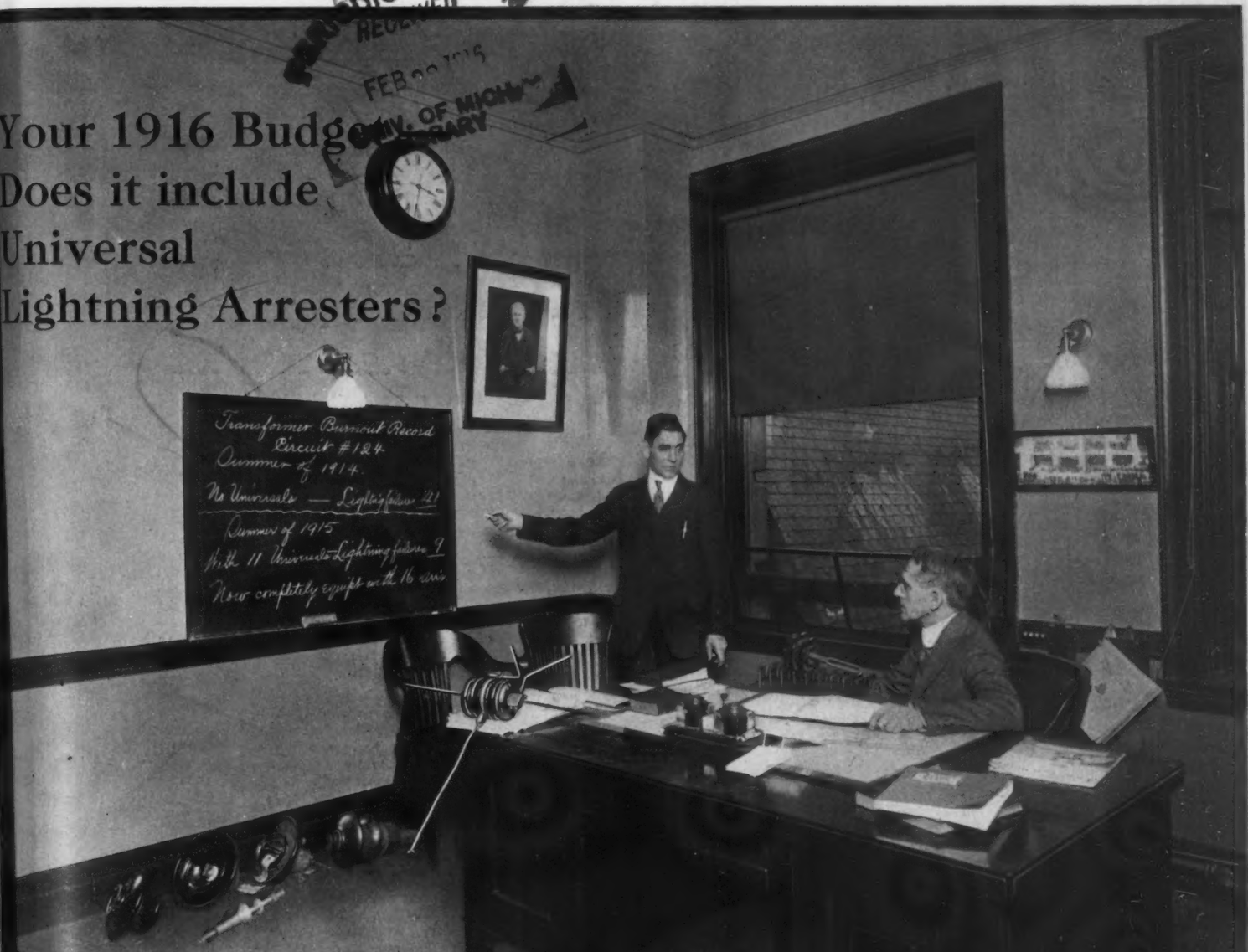
The Newspaper and Electric Service Sales—Sign and Appliance Campaigns, with Other Articles of Interest to the Commercial Man and Engineer

Electrical World

Volume 67, Number 9 McGraw Publishing Co., Inc. New York, February 26, 1916

Engineering Library MEDICAL ROOM RECEIVED FEB 29 1916 UNIV. OF MICH. LIBRARY

Your 1916 Budget Does it include Universal Lightning Arresters?


Transformer Burnout Record
Circuit #124
Summer of 1914.
No Universals — Lightning failures 41
Summer of 1915
With 11 Universals Lightning failures 9
Now completely equipt with 16 Uni

District Superintendent—"Chief, there are the results I got from the forty-five dollars you authorized a year ago for Universal Lightning Arresters on the long 24 circuit. They paid for themselves over 14 times in one season. I want authority to equip my whole district in 1916."

Superintendent—"On that showing they would pay without a cent of actual money saving. Think of the interruptions to service that the arresters cut out. But have they made you any trouble?"

District Superintendent—"Not a single case of trouble since I put them up. Look at that one I brought in off the line for you to look over. It hasn't any moving parts or housings. It is made of porcelain and brass and a galvanized steel pipe choke coil. It can't rust and it can't rot, and the bugs and birds can't build nests in it. It will outlast any other part of the line."

Superintendent—"All right, John, I'll O. K. it. Your experience confirms the judgment and investigations of our engineers."

Send for Bulletin 16 or see pages 151-5 of your 1916 Hubbard Catalogue

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The Hardware MAKES The Line
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WATTMETER

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A. C. and D. C. Portable Electrodynamometer
AMMETER

An instrument of Precision which represents the latest developments in refinement of design and workmanship, and embodies distinctive features of great value. Its superiority to other forms of Portable Wattmeters places it in a distinct class of its own.

It is guaranteed to an accuracy of ½ of 1% of full scale value on *A. C.* Circuits of any frequency up to 133 cycles per second and on circuits of any wave form. It can be used on circuits of any commercial frequency even as high as 500 cycles per second with very slight error due to phase displacement. Double ranges are provided for both current and voltage circuits. All current ranges can be used for 100% overload indefinitely without introducing error.

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The scale which is 5¼ inches long, is uniform throughout the *entire* length, a characteristic of great value. It is hand-calibrated and provided with a mirror over which the knife-edge pointer travels, and the pointer may easily be adjusted to zero by means of a zero-correcting device.

For complete information regarding Model 329 Polyphase Wattmeters and Model 310 Single-Phase and Direct Current Portable Wattmeters, write for Bulletin No. 2002. Other Models in this group are Model 341 A.C. and D.C. Portable Voltmeter, described in Bulletin No. 2004; and Model 370 A.C. and D.C. Portable Ammeter, described in Bulletin No. 2003.

Weston Portable Instrument Transformers are described in Bulletin 2001

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Electrical World

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The Universal Engineer

ENGINEERS have a purpose in common whether they prefix the qualifying adjective "electrical," "mechanical" or "civil" in signing their names. The pursuit of facts has developed this common purpose and with it has brought a responsibility to the public which engineers as a group are more and more alive to. The public has turned to the engineer for opinion and advice, not only on the technical problems individual to the branches of the profession but on the broader problems of national import. It is with keen appreciation, therefore, that we comment on the proposed plan whereby the civil-engineering profession shall be housed in the same building with the two other great national engineering bodies. The civil engineers have the longer history, the more far-reaching traditions. But in common with the younger organizations they face the problems just over the line of the profession itself which are coming to be a part of all engineering and in which all engineers may act in concert without destroying their individualities as men or as associations. Engineering in earlier days was divided as military and civil. It is a singular circumstance that the necessities of war which long ago caused this separation in function are to-day realigning and regrouping engineers. The national movement in which the country is taking census of its responsibilities in the case of war demands a large place for the engineer and engineering ability. The bringing together of all the engineers of the nation for the extension of these and other common purposes is a natural evolution and one in which our national motto, "E pluribus unum," has a very real significance.

Dr. Louis Duncan

THE death of Dr. Duncan at the early age of fifty-three is a grave loss to the engineering profession of the country. In particular it strikes with a sense of the deepest personal regret all the men who were closely associated with Dr. Duncan in his professional work and who knew him as a friend and colleague. Trained at the United States Naval Academy and serving his country on sea and land up to the time of his resignation to initiate the electrical-engineering course in Johns Hopkins University, Louis Duncan developed in a school of thoroughness and probity that makes for the highest professional character and attainments. He obtained his technical training while detached for service at Johns Hopkins University under the late Professor Rowland and made a mark for himself there which will be long remembered. His work with Professor Rowland on the determination of the ohm still remains as a monument of delicate research leading to the most important of practical results. Those who knew him from those early days as instructor, colleague and friend realize therefore to the fullest the loss which the engineering profession has suffered in his death.

Dr. Duncan's most dominant characteristic as an engineer was a keen and biting common sense and that remarkable scientific insight which is required to transform the skillful theorist into the eminent practician. He was possessed in a very high degree of originality and fine resourcefulness in attacking engineering problems. Nothing was more distasteful to him than the commonplaces of the routine engineer who is willing to write up his constructional prescriptions from the catalogs of manufacturers and let new methods alone if they have not received the mint mark of standardization from those who are pecuniarily interested in exploiting them. Most of Dr. Duncan's professional work bears very strongly the impress of the clear-thinking man of science who never forgets the importance of directness and efficiency in reaching the required results. His professional career was a model of that fine probity to be expected from an officer and a gentleman, even at times when the engineering profession has been under grave suspicion of yielding too readily to the importunities of commercialism. Those who knew him best realized the stern stand which he always took for maintaining the integrity of the profession and the contempt in which he held the hypocrite and the "slacker."

As a teacher, his pupils retain a most affectionate memory of his powers. To the student of imagination and broad vision he was an inspiration, to the patient and hard-working a friend and counselor, to the small-minded and the lazy a terror. Dr. Duncan early specialized in electric-railway work, and his professional career covers that art almost from its beginning, when he collaborated with Frank J. Sprague on the fundamental experiments at Richmond, Va. His work in this field has left a strong impress on electric-railway development, particularly through the Middle West, where his recent activities in this line were conspicuous. In later years he served often as a patent expert, and his testimony in patent causes bore the same marks of directness and clarity that were characteristic of his career as an engineer. The same incisiveness in mind and unwavering honesty in thought and deed followed all his technical activities and led him to a commanding position in the history of American engineering and to the unqualified trust and affection of those who knew him as a friend.

The Opportunity in the Partially Wired Home

THERE is danger that too many contractors and central stations will interpret the coming "Wire-Your-Home Month" campaign—March 15 to April 15—as a campaign to wire old houses only, forgetting that there is profitable wiring to be done for present customers as well. The unwired house is naturally the first objective of the campaign, and nothing should be done or left undone that will weaken the methods of getting this class of prospective business, yet, after all, the ultimate purpose of the campaign is to bring about a greater use of electricity, and present customers should be considered. How many connected homes there are where the wiring system is so inadequate as to restrict the use of the service! How many instances we all have seen where the use of available energy-consuming appliances has been abandoned simply because the shortcomings of the installation have made them inconvenient! The man in the unwired house must usually be converted through the educational process of selling, but the man who is now using electric service is already committed to the principle and needs only to be shown the advantages of an added convenience. Therefore the market for additional wiring becomes more promising and profitable and should not be neglected in the local "wire-your-home" campaign. The publicity material which is being prepared by both the Society for Electrical Development and the National Electric Light Association will carry a message to the prospective customer both in the unwired home and in the partly wired home. The local plan should embrace both classes of business.

A Problem in Church Lighting

CHURCHES in general are the despair of the illuminating engineer. Not only are the interiors generally dark in tone but the architectural features are such as to make proper placement of fixtures difficult. More than this, there are often very bad fixtures already in position, given years ago by old Deacon Somebody, whose widow still survives. Escaping such a heritage, the church may have suffered equally at the hands of the architect who fails to realize that a fifteenth-century fixture designed for glimmering candles in an age when the worshipers could not read is out of place in a twentieth-century auditorium where reading is expected. It sometimes seems as if the architect had as fine a scorn for the possibly efficient as the cloud-dwelling mathematician is supposed to have for any conceivable practical use for his theorems. Be this as it may, churches present problems both physically and psychologically difficult, and the case described by A. L. Powell and R. B. Thompson in the current issue is typical of many another. Bad as was the lighting system already in use, the engineers had one great advantage in that the interior was light in tone and the ceiling spacious, flat and white, after the somewhat Puritanical type of the early nineteenth century. More often when a church committee gets the indirect-lighting bee in its communal bonnet the church is pseudo-Gothic with fumed-oak beaming and generally funereal effect.

In this instance fortune favored and indirect lighting was thoroughly feasible. The stages of its evolution are extremely instructive. Messrs. Powell and Thompson got down to first principles and, finding that suitable commercial types of reflectors were not available, exercised their ingenuity in making box reflectors to suit the case.

The final results seem to be excellent and reflect great credit on the resourcefulness of the engineers who, confronting the perhaps unwise requirement of a totally indirect system, nevertheless developed a very ingenious and successful scheme for the particular conditions. Every church, however, is a problem by itself, so that every solution, be it ever so skillful, is special and not general in its applicability.

Measuring Light with the Average Eye

IT is a remarkable fact that in practically every quantitative science except that of photometry the human-sensation estimate is ruled out of court in the formation of a trained judgment. There is always some instrument whose indications are taken as a substitute for the sense estimate. The weight of a heavy body that can be lifted by the arms can always be estimated by the lifter. But the precision of such lift estimates is ordinarily amusingly low compared with that which is readily obtainable with any standard form of weighing machine. When, however, it comes to comparing illuminations there is no available machine. The human eye remains the final arbiter and court of last resort in photometry. The photometer is merely a device for facilitating the judgment formed by the eye as to the quality of two juxtaposed contrasted illuminations and for enabling that judgment to be conveniently reduced to numerical form. For this reason the precision attainable in photometry is low by comparison with that attained in other classes of measurement. In order to compensate for this inherent lack of precision, resort is often made to multiplication and repetition of photometric observations, so as to improve the precision of the mean, according to the theory of accidental errors.

In the comparison of lights of the same color—i.e., in homochrome photometry—careful and numerous measurements jointly supply a satisfactory degree of precision. When, however, the lights compared differ materially in color—that is, in heterochrome photometry—the difficulty of arriving at suitable precision is greatly increased. It seems that the eye virtually employs a different sense organ in the perception of each color, so that comparing equality of illumination in the red and in the blue may be roughly likened to comparing equality of two pulls, one exerted on an arm and the other on a leg. The differences in estimation, as between different observers, increase markedly as the lamps compared in the photometer diverge in color, although experience and practice assist in forming an estimate.

A paper on the "average eye" in heterchrome pho-

tometry was read at the recent New York convention of the Illuminating Engineering Society by E. C. Crittenden and F. K. Richtmyer. Results of observations made by 114 observers at the Bureau of Standards show a certain average estimate of color comparison and a probable individual error of some 3 per cent, from which a close estimate can be made of the flicker behavior of the average eye. It is curious that by comparison with equal-brightness photometers flicker photometers tend to give lower values of the candle-power of lamps very strong in the blue, or tend to establish a blue-sky law of their own.

Despite the strong opposition which has appeared in the past toward flicker photometers in the national standard laboratories of the world, it would seem that ultimately the flicker photometer is likely to replace equal-brightness photometry for accurate comparisons.

Water-Power and Industrial Preparedness

FOR almost ten years Congress has debated on water-power legislation and brought forth nothing—indeed, less than nothing. For whenever it has bestirred itself by such measures as the Burton act it has hindered development rather than encouraged it and has throttled American industries begotten through cheap electrical energy and depending on an increasing supply of it for their proper encouragement and expansion. If the generation of electricity from water-power and its distribution far and near for the benefit of civic and industrial life were fraught with danger and abuses, there might be some reason for the present situation, but not even the bitterest opponents of water-power legislation have denied the great advantages which have accrued to civilization by the harnessing of streams for the development of hydroelectric energy. All agree that electricity is one of the great potent factors of the universe; that electrical developments are making greater strides than any other branch of science or adjunct of civilization; that by using the power of streams electrically actual conservation of natural resources is possible, and that the question is worthy of careful attention and sound legislation in the interest of the public. Yet we fear there will be hearings on hearings, measures on measures, amendments on amendments, until a Moses comes to lead us out of the wildnerness.

A notable example of just what cheap hydroelectric energy means to the industries of this country and how sorely additional energy is needed for the upbuilding of further industries is furnished by Niagara Falls. There are situated the greatest electrochemical industries of the world, not one of which was in existence when the Niagara Falls Power Company began to take water from the Niagara River to generate electricity. Aluminum, carborundum, alundum, silicon, artificial graphite, calcium carbide, cyanamide, ferro-silicon, ferro-chromium, ferro-manganese, electrolytically produced caustic soda, sodium, chlorine, chlorate, chloroform, carbon tetrachloride are all commercial products of vast industrial importance, most of which were developed through the impetus given by the Niagara Falls power development. If the country is to be prepared industrially to meet any military or commercial crisis, this industry centered at Niagara Falls and fostered by cheap hydroelectric energy must be encouraged. There must be developments along the line of peaceful constructive manufacturing, an increase in skill and knowledge, and a retention of the skilled force of workers, chemists, engineers and operatives necessary to that industry. The electrochemical industry is already established at Niagara Falls and cannot be easily transplanted. It is now handicapped owing to lack of electricity. Much that is now used at Niagara Falls is imported from Canada. This fact in itself should cause the government to blush.

Why should it be necessary for American industries to import power that might be developed in the United States, or why should it be necessary to permit a large city like Buffalo to be more or less dependent upon energy imported from Canada? Already there are plans afoot to prohibit the exportation of electrical energy from Canada into the United States which, if successful, would seriously hamper the industries along the Niagara frontier. Here is one power situation in urgent need of attention. There is millions of horsepower running to waste which is sorely needed and which might be developed if the government would only make it possible. Even under the old treaty between the United States and Canada there is 4400 cu. ft. of water per second still available which has not been allotted to any power company by the Secretary of War. Put to use even this amount of water would be of some help, but the great bulk of power at Niagara Falls should not be permitted to run to waste especially since the harnessing of a million horsepower would not even detract from the scenic grandeur of the cataract of which so many well-meaning citizens seem to be so fearful. One cannot read the account of the meeting of electrochemists at Niagara Falls given elsewhere in this issue without imbibing some of its truth.

The Coming Issues

THE issue now before the reader is the commercial number of the ELECTRICAL WORLD for February—the fourth issue of the month, in which emphasis is regularly laid on topics of selling electric service and appliances and widening the uses of electricity. Next week, in the first or public-relations number of March, will appear an article on "Taking the Customer Into Partnership," recounting the successful experience of a group of utility companies in the Northwest in cementing friendly relations with their local public through the sale of small blocks of stock to customer-investors. A summary of important cases now before the public-service commissions of the country is also planned for the March 4 issue, besides the usual engineering articles and departments. In the station-operating number of March 11 among other articles will be one of timely interest giving data on the performance of several small generating stations with comment on their comparative achievement.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

Illinois Central-Station Men Discuss Utility Regulation and Boiler Economies

Efficiency in the boiler room was the topic which elicited most discussion at the first of the three half-day sessions of the Illinois State Electric Association in convention at Champaign, Ill., Feb. 23 and 24.

The delegates were welcomed to Champaign and to the University of Illinois, where the meetings were conducted, by David Kinley, vice-president of the university. In his talk Mr. Kinley spoke of the relations of mutual helpfulness which should exist and do exist between the State University and the officers and operators of the State's public utilities. He outlined the purpose of the university in its technical work, which not only makes it aim to keep in touch with advancement in science but leads it to contribute its share to scientific development.

E. McDonald of Hillsboro, Ill., president of the Illinois association, in his address, recalled the fact that this meeting was the first the association had had in two and one-half years. From the viewpoint of the Illinois central-station man the most important event that has taken place since the last convention, said he, is establishment of commission regulation of public utilities. Mr. McDonald expressed the opinion that in the long run commission regulation will prove beneficial to the central-station business, but he declared that to date the effect of regulation has been to check the growth of the industry. He suggested that relief from regulatory troubles might be brought about if the central-station men would point out to the commission the need for specific constructive changes in the regulatory processes.

A paper entitled "Some Aspects of Boiler Efficiency," by H. J. Klotz of Decatur, Ill., setting forth in a broad way some of the economies that can be effected in steam-electric plants, evoked a wealth of discussion, leading finally to an experience meeting on boiler troubles, water troubles, and the best methods of purchasing coal.

Among those who spoke in the discussion were E. H. Negley of Canton, H. E. Brandlie of Mount Vernon, W. F. Corl of Hillsboro, E. B. Parr, E. B. Paine and H. J. Pepper of Champaign, R. S. Wallace of Peoria, D. D. Higgins and P. B. Juhnke of Chicago.

Congress Divided on Water-Power

No Hope of Favorable Report on Measures Now Pending for Some Time—Testimony of Ex-Secretary Garrison

It is very difficult at present to forecast just when the present chaotic condition of water-power legislation will assume definite shape in Washington. A fight to preserve the undeveloped water-power sites of the country for the benefit of the people was started in the Senate last week. Senators Kenyon and Cummins of Iowa, Norris of Nebraska and La Follette and Husting of Wisconsin served notice on the Senate that they will no longer permit uninterrupted favorable discussion of the Shields bill. Senator Walsh of Montana, although not co-operating with them, opened a vigorous attack on the measure also.

Gifford Pinchot has sent out a general letter attacking the Shields bill, claiming that it gives to the power interests without compensation the use of water-power on navigable streams. He also attacked the Ferris bill, which he said was in the main a good bill as it passed the House but as reported to the Senate encourages monopoly by permitting a corporation to take as many public water-power sites as it may please. All of the Senators mentioned with the exception of Senator Walsh have attempted to saddle the Shields-Adamson measure for regulating the construction of dams across navigable waters with modifying amendments.

It was held by the opponents of the measure that the claim set forth by its advocates that it had been approved by former Secretary of War Garrison and the army engineers is entirely false. From details of the hearings on the question of amendment of the general dam act which have just come to hand, Mr. Garrison was especially asked to discuss two phases of the question before the Senate commerce committee—first, shall the special consent of Congress be required upon each application for a permit to develop water-power on navigable streams or may the permit be granted by the Secretary of War? second, shall a federal charge be laid upon the privilege?

CHEAP POWER NECESSARY TO MEET INDUSTRIAL DEMANDS

The ex-Secretary of War pointed out that since the day the nation was founded the total development of water-power in the navigable waters has reached only 7,000,000 hp. He accepted the estimate that the quantity developable "in the upper reaches and in the feeders of navigable waters where the construction of a power dam would necessarily have an appreciable influence on the navigable capacity of the stream in its actual navigable portions, and should therefore be subject to federal control," probably would add 20,000,000 hp. "The statement of the figures," said Mr. Garrison, "impresses the mind with the necessity of action to prevent this great waste of power, to harness it and put it into use, and at the same time save the great quantities of coal now being consumed in use beyond all renewal. Such is the demand of true conservation.

"Cheap power is necessary to meet our great industrial demands in the production of nitrogen, steel, zinc, aluminum and ordinary commercial fertilizer. There is perhaps a lack of appreciation of the full extent and variety of the use to which cheap power can be and in other countries is being put. The sole use of such power is not to be found in the usual municipal utilities, though of course such utilities will always constitute a part of the use. Modern science has achieved uses for hydroelectric energy in the fixation of nitrogen and in metallurgical processes which make it of the highest consequence."

The ex-Secretary of War made the statement that the federal government is in a position now where it absolutely prohibits because it permits only under impossible conditions.

Speaking of the right of Congress to impose a federal tax, Mr. Garrison said:

"Aside from any question of federal authority that may be thought by some to be involved, in my judg-

ment, and as a matter of policy this question should be answered in the negative. The reasons thus far advanced for the proposition do not appear to me to be sound. In the case of navigable streams the federal government owns neither the water nor the bed of the stream; its power comes from a right to say what obstructions may or may not be placed in the stream. Upon a navigable stream the government owns nothing, has nothing to sell, whereas the government owns the power site itself upon the public domain. The federal government does not qualify the grantee nor give him the primary authority to engage in the business. The property of the grantee is private property, situated within a state."

Co-operative Effort and Industrial Preparedness

Why Business Organizations and Trade Associations Should Band Together to Solve the Industrial Problems of the Country

Speaking before the Electrical Supply Jobbers' Association in Detroit last week, Edward N. Hurley of the Federal Trade Commission reiterated many points previously enunciated by him relative to the aims and hopes of the commission in awakening American business men to the opportunities which confront them and also in impressing them with the necessity of knowing exactly what the costs of production are.

"Co-operation," he said, "is a primary requirement in meeting the questions that confront manufacturers, jobbers and retailers to-day. If our industries are to prosper, it must be through team work. They must settle the problems of cost accounting and develop efficient methods and processes of manufacture and distribution and better understand advertising methods.

"The small contractor who handles jobbers' supplies is making progress under your guidance, and you are to be particularly commended in your endeavors to assist him in becoming a successful merchant. Organization is essential for this educational work. Through the co-operative efforts of your association, with experienced men in its different branches, you are able to work out your problems along sound, practical lines.

"You are selling the products of the manufacturer. You are advertising and popularizing his wares. Your energy and effort, while being put forth for the benefit and profit of yourself, make it possible for the manufacturer through your agency to distribute his product in large volume and at a cost presumably lower than if sold directly by him. Economies that the manufacturer or the jobber practice in distributing electrical products should be made for the benefit of all concerned. The manufacturer should put forth every effort to assist the jobber.

"Some of you are engaged in one branch of this great industry, some in another, and the size and burdens of your establishments vary, but all have to face the same general problems. All are affected by the same large factors in the industrial situation. Questions of freight, supplies and labor are common to you all. In meeting together you broaden your individual outlook on business as a whole and are able to bring your combined experience and knowledge to the solution of problems which affect each member.

THE RELATION OF COST ACCOUNTING AND PRICE CUTTING

"When business was done on a large percentage of profit, questions of accurate cost and of operating efficiency were not so important, but in most lines of industry to-day the large percentage of profit has passed. Manufacturers and distributers are working on smaller margins and must absolutely know what it costs to produce and to sell their goods. Any unreliable method of arriving at cost of production, with margins of profit so close, must be eliminated.

"It is a fact well understood among business men that the general demoralization in a large number of industries has been caused by firms which cut prices, not knowing what their goods actually cost to manufacture, and which almost wholly lose sight of the cost of selling, which is equally important. Are the officers of the companies who are cutting prices right and left, irrespective of their costs, fair to their customers, stockholders or competitors? Quality and service are becoming greater factors in the field of merchandise. Long after the price of a product is forgotten the quality of that product is remembered.

"A manufacturer who does not know with a close degree of accuracy what it costs him to produce the different articles he manufactures and what it costs him to sell them is not in a position to meet intelligently competition and invites business disaster.

"You know, and I know, that, lumping all business together, the real need is for better business methods. We must get down to the hard facts of business, learn precisely what they are, where the weakness and losses exist, and practice the same thoroughness which characterizes trade and industry in Europe. To be progressive jobbers we must be improving our methods of doing business, changing our plans to meet the new conditions both at home and abroad, and always endeavoring to adopt some new method that will reduce the cost of operation. We must learn to work heartily together.

"The trade association has a wide field of useful and proper activities. Concerns in the same industry may take common action looking toward improving their processes of manufacture, standardizing their products, improving their system of ascertaining costs, perfecting methods of selling, obtaining credit information, and encouraging the development of trade journals.

"So, to-day, organizations like the Electrical Supply Jobbers' Association, if conducted in a spirit of mutual helpfulness, with the machinery of the government standing by subject to call, will help solve pressing problems and remove many of the present handicaps of business.

AFTER THE WAR, WHAT?

"Perhaps you may think I am over-earnest in this advocacy of organization, higher efficiency in business methods and modern practices, the adoption of European ideals of thoroughness, the standardizing of accounting, but my earnestness proceeds from an understanding of the conditions which confront American business. The war has brought to us great opportunities and equally great dangers. The thought that we must keep in mind is, 'After the war, what?' Shall we grow and expand while the growing is good or calmly await the time when peace in Europe will be followed immediately by keen competition not only in foreign markets but in our domestic market as well?

"Have we taken an adequate inventory of our business resources? Are these resources being developed to the best advantage? Are our associations doing all they can? Are we diligent in standardizing our methods and processes? In short, are we mobilizing our industries?

"Let us seek better organization and greater efficiency at home; let us push our trade abroad; let us develop our industry so strongly that no foreign competition can dislodge it. Industrial preparedness must be our watchword."

Convention of Illuminating Engineering Society to Be Held in Philadelphia

At a meeting of the council of the Illuminating Engineering Society held Feb. 11 it was decided to hold the 1916 annual convention of the association in Philadelphia next September. The council accepted the invitation of the University of Pennsylvania to hold a course of lectures on illuminating engineering at that institution next fall.

The publication of a complete list of members was authorized and this list will be available in the near future. It was also voted to have published a special number of the transactions of the society, to be designated as the Edison Decennial Number. This number is to include the addresses given at the midwinter convention which was held Feb. 10 and 11 to celebrate the tenth anniversary of the organization of the society, colored views of the lighting of the Panama-Pacific Exposition, and other material of special interest.

Convention of National Electrical Contractors' Association

James R. Strong of the Tucker Electrical Construction Company of New York City, who is chairman of the national convention committee of the National Electrical Contractors' Association, has sent out an open letter to contractors about the forthcoming convention of the association, which will be held at the Hotel McAlpin, New York, July 17 to 22. The first two days of the meeting will be given over to the deliberations of the executive committee and the board of directors.

The first session of the convention proper on July 19 will be open to all. Four or five speakers have been provided, including President Lewis H. Woods of the New York State association, President John R. Galloway of the National Electrical Contractors' Association, John Purroy Mitchel, Mayor of New York City; James H. McGraw, president of the McGraw Publishing Company; T. Commerford Martin, secretary of the National Electric Light Association, and Arthur Williams of the New York Edison Company. This session will be followed by a business session in the afternoon, open only to contractors.

With a view of interesting electrical contractors who are not members of the National Electrical Contractors' Association, the executive committee has decided to invite all electrical contractors to attend the morning business session on July 20, at which time two very interesting reports will be presented. The first of these is that of Joseph A. Fowler of Memphis, Tenn., chairman of the insurance committee, on the national plans for joint liability and compensation insurance, whereby a large saving in insurance premiums is effected for members. His report will be supplemented by an address by L. T. Block, manager of the Utilities Indemnity Exchange of St. Louis. The other report will be presented by E. McCleary of Detroit, chairman of the National Electrical Code committee, who will give data on the code, and also designate someone to give the latest data regarding the much discussed "concentric wiring." Discussions on these subjects will take place, in which members and non-member contractors will be expected to join.

There will be a business session on July 21, after which the association will visit Long Beach, L. I., for a dinner-dance and entertainment. On the closing day of the convention the directors and executive committees will meet for organization, and the convention will conclude with a trip around New York by water.

Arrangements have been made with the hotel management for space in the terra-cotta room for exhibits by manufacturers. The association has no official connection with this exhibition, however.

Convention Plans of Northwest Association

Tentative plans for the next annual convention of the Northwest Electric Light and Power Association, which will be held in Seattle next September, indicate a radical change in the program as compared with past conventions. Instead of a relatively large number of short papers, the program will probably consist of not more than four comprehensive papers, all to be written by representatives of four of the larger company members of the association. In addition, there will be one paper by an outside author and the report of the range committee.

It is the intention to have the papers themselves in the nature of committee reports. Each company to which has been delegated the task of preparing a paper will appoint an editor and sub-editors, who will do the actual work of getting up the report. All papers are to be completed well in advance of the convention and will be abstracted and mailed to members of the association.

The tentative assignment of subjects to the various companies is as follows:

"Application of Overhead-Line Construction Rules of the Public Service Commissions of the Northwest" to the Puget Sound Traction Light & Power Company of Seattle.

"The Effect of Obsolescence of Equipment on Cost of Service" to the Portland (Ore.) Railway, Light & Power Company.

"The Employer as an Educator of the Public" to the Wenatchee Valley (Wash.) Gas & Electric Company.

"Merchandising and Operating in Small Towns and Communities" to the Pacific Power & Light Company of Portland, Ore.

The program committee consists of W. J. Grambs and M. T. Crawford of Seattle, J. V. Strange of Prosser, R. C. Coffee of Everett, W. S. Mendenhall of Aberdeen, L. A. Lewis of Spokane, all in Washington, and E. A. West and F. O. Broili of Portland, Ore.

Electric Lighting of German Barracks

Owing in part to the shortage of kerosene resulting from the war, electricity is coming to the fore in German barracks as an economical and superior illuminant. The up-to-date lighting of barracks received consideration in the German parliament during the discussion of the last military budget prior to the war. The new artillery barracks at Allenstein meet all requirements of modern lighting, and the reserves quartered there were highly pleased when, in place of the customary kerosene lighting, they found a modern electrical installation.

In these barracks the rooms of the privates are equipped according to size with from one lamp to four lamps each, mainly 16-cp. units. The lamps are turned on in the evening by a non-commissioned officer from a main switch, and after 10 p. m. (9 p. m. in winter) are similarly switched off. The lamps in the rooms of the training officers are independent of the main switch, and all the rooms can be lighted when necessary by special switches in the corridors. Careful handling of the kerosene stock on hand has been necessitated, and the freedom of service afforded by electricity has been much enjoyed. Germans who have seen the installation

point out that electric service renders the country less dependent upon the outside world, since the immense deposits of coal available in Germany afford ample means of electrical supply under the most adverse conditions. Even in domestic service the sales of electricity for lighting are rapidly increasing as a result of the shortage of oil.

San Francisco Adopts Scheme for Brightening Market Street

The city of San Francisco has accepted the offer made by the Pacific Gas & Electric Company for installing along Market Street the luminous-arc lamps which were used at the Exposition. The lighting company offered to mount three lamps on a suitable ornamental top placed on the trolley poles now in use and to maintain the lamps and supply energy for their operation at no expense to the city or property owners for the initial installation, provided that the property owners will enter into a three-year contract for the lighting service. According to this arrangement, the Pacific Gas & Electric Company will finance the undertaking and will be responsible for installing and maintaining the service, so that the city will be concerned only with monthly payments.

On this basis the annual cost of operating the proposed improvement from the ferry to Seventh Street will be $37,200. Of this total the city has agreed to pay $12,750 per annum, the United Railroads under their franchise agreement will pay $7,440, and the merchants and property owners organized as the Downtown Association will pay the remainder, about $17,000 per annum. The details of the plan for appropriating the assessment upon Market Street property have not yet been worked out. This, however, is a matter which will be settled by the Downtown Association, and it is understood that assessments may range from $1.75 to $4 per front foot, according to the nature of the business.

The installation cost is estimated to total between $90,000 and $100,000, and will involve placing the new series circuits which the arcs require. Market Street is 75 ft. wide, the trolley poles are on the average 110 ft. apart, and the length of the thoroughfare to be lighted—that is, from the ferry to Seventh Street—is about 6300 ft., exclusive of crossings. The wire circuits are to be arranged so that two of the units can be cut out at midnight, leaving one central unit burning for the remainder of the night. The same three-lamp arrangement will be used at crossings as along other parts of the thoroughfare, except that the Board of Harbor Commissioners has agreed to install at the ferry terminus of Market Street two five-lamp and two three-lamp standards to correspond with the general Market Street scheme.

The three-lamp units will give about fifteen times the illumination afforded by the present system, and the energy consumption will be about three times that now required. The Exposition lamps are the 6.6-amp. General Electric luminous arc, known as "Form 10 ornamental." The consumption per lamp is 530 watts, and with the new high-efficiency electrode the lamp will develop initially 1900 cp. It is planned, however, to use an ornamental eight-section globe with a tinted glass which will have an absorption of about 30 per cent. W. D'A. Ryan, formerly chief of the department of illumination of the Exposition, who has developed and advocated the Market Street illumination plan, is now conducting experiments in Schenectady to determine just what tint shall be specified in the new ornamental globes.

Power Situation at Niagara Falls

Local Section of American Electrochemical Society Indicates How Seriously the Electrochemical Industries Are Hampered Owing to Shortage of Power

The Niagara Falls Section of the American Electrochemical Society discussed at its February meeting the power situation at Niagara Falls. The chairman of the meeting, F. A. Lidbury, pointed out that local electrochemists had long foreseen that the governmental restriction of power development at Niagara Falls must ultimately result in the present situation, in which the shortage of power is seriously hampering the electrochemical industries and through them the industries of the country at large.

That much of the trouble is due to lack of co-operation on the part of the power companies was intimated by one of the representatives of the latter, who said that "if the power companies had been together in anything beside their woes conditions might have been very different." It was brought out that from 125,000 hp. to 150,000 hp. was being transmitted into the United States from the power stations on the Canadian side at Niagara Falls, and that this importation of energy depended upon permits revocable by the Canadian government. One speaker indicated that the right to export electricity from Canada will be revoked sooner than most people imagine.

The generation of large quantities of additional power on the American side at Niagara Falls, and that rapidly, was, in the estimation of many, the only way by which a dislocation of American industries could be avoided. Engineers present contended that with a suitable system of submerged weirs the flow of the Niagara River could so be controlled as to render 50 per cent of the water available for power purposes and with the remaining 40 per cent provide, in addition, a grander spectacle than now exists. This control would diminish the natural erosion at the peak of the horseshoe, where a large volume of water is now plunging over without enhancing the spectacle in the least, while causing the recession which tends to diminish it. All of the electricity developed by the Hydraulic Power Company except 15,000 hp. is employed in the electrochemical industries, and the greater part of the output of the Niagara Falls Power Company is similarly employed.

F. J. Tone, in a well-prepared paper, showed to what extent electrochemistry was indebted to Niagara power, and also how American industries in general would be paralyzed if the electrochemical companies at Niagara Falls should fail to meet the call made on them. The steel industry, for instance, he said, is absolutely dependent upon Niagara power by reason of its requirements in ferro-alloys. In 75 per cent of the 20,000,000 tons of basic open-hearth steel made in this country in 1915 there was used as the main dioxidizing agent ferro-silicon produced in the electric furnace by Niagara power. In fact, all ferro-silicon made by electric furnaces in America is now produced from Niagara power.

The most striking example, however, of the intimate relationship between the metal-working industries and Niagara power is that of high-speed steel. All of the essential alloys for the manufacture of high-speed steel are produced in Niagara Falls, and they are also made elsewhere by the use as a reducing agent of metallic aluminum, which is likewise a product of Niagara power. Ferro-chromium is also the hardening element in armor plate and armor-piercing projectiles, and not a battleship is afloat that has not many tons of it in her armor; yet up to three years ago the country was dependent on Europe for one-half of its supply.

The abrasive industry is one intimately connected with industrial life. Without adequate grinding mate-

rials the most important industries of the country, including the manufacture of automobiles, agricultural machinery, steel and malleable iron, marble, granite, and all finished products of iron and steel, would be greatly handicapped, and in cases their output would be reduced to a fraction of the present total. The abrasive situation to-day is another striking illustration of the dependence of industry on Niagara power. There are four artificial abrasive plants operating with Niagara power, and they produce all the artificial abrasives used in this country. Their annual output is about 20,000 tons. If this supply were cut off, a partial paralysis would follow throughout the metal-working industries. One of the big Western manufacturers of automobiles, it was brought out, plans during 1916 to put out a thousand cars a day. In the factories of that company grinding machines form about 25 per cent of the total equipment. If those works were forced to go back to the grindstone and were at the same time deprived of high-speed tool steel, aluminum, oxy-actylene welding and other products produced by Niagara power, it is not an exaggeration, according to the speaker, to say that their output would drop from 1000 to 100 cars a day, with the same plant equipment and the same number of workmen.

Aluminum and calcium carbide, the largest of the electrochemical industries as regards the power consumed and value of products, were first made possible by Niagara power, and on these products as well as other Niagara products, such as bleaching powder, alkali, chlorine, phosphorus, graphite, sodium and cyanide, depend a whole line of America's basic industries. To-day nitrogen products are unquestionably the most important ones in the field of chemistry. Without them modern warfare would be impossible. Yet the only nitrogen-fixation works operated by Niagara power are those of the American Cyanamid Company, and this pioneer industry was forced to go to the Canadian side to obtain sufficient power. In any program of industrial preparedness and self-containedness chemical preparedness and chemical self-containedness play a big part, and their chief requisite is more Niagara power.

Ask Legislation Restricting Export of Power to United States

Resolutions dealing with several phases of the hydro-electric power situation in Canada were passed by the Ontario Hydro-Electric Railway Association at its meeting at Toronto on Feb. 16, at which nearly every municipality was represented. Chief among these resolutions was one calling on the Dominion government to pass legislation restricting the export of power to the United States. Other resolutions asked the government to prevent the existing power companies from increasing their capital for the purpose of making extensions to their plants and urged the provincial and Dominion governments to grant subsidies to aid the municipalities in the construction of the projected radial lines, and to vote moneys for the improvement of Port Stanley harbor. The provincial government was asked to curb the powers of the existing companies, and to prevent them from expanding, also to cancel the franchises of such companies as had not yet done any construction work in regard to the lines for which the franchises were granted, and to pass legislation to authorize the Provincial Hydro-Electric Commission to proceed with the final surveys and to acquire rights-of-way for the proposed "Hydro Radials," as voted upon by the people at the recent municipal elections. Both governments were also asked not to grant new franchises for railways to any private interests.

New Electrical Contractors' Associations in Northwest

The Oregon Association of Electrical Contractors and Dealers and the Washington Association of Electrical Contractors and Dealers have recently been organized, with headquarters in Portland and Seattle respectively. The constitutions and by-laws of these organizations have been patterned along the same lines as those of the California Association of Electrical Contractors and Dealers. About fifty members were enrolled at the outset in the Oregon association and about thirty in the Washington association. Each of four jobbing houses represented in Seattle agreed to secure seven new members for the association within thirty days, or in case less than seven new members were secured in this time to pay the $3 monthly dues of the missing ones until all seven had been secured.

Difficulties of Commission Work

Chairman McLeod of Massachusetts Public Service Commission Tells of Expanded Duties Expected of Regulating Bodies

An interesting discussion of the difficulties of commission regulation was presented at a recent legislative hearing at Boston, Mass., by Chairman F. J. McLeod of the Massachusetts Public Service Commission. The committee on the message of Governor McCall was sitting upon bills providing for consolidation of the Public Service Commission with the Massachusetts Highway Commission or the Boston Transit Commission. Chairman McLeod was asked by the committee to outline the increased responsibilities laid upon the commission by the act of 1913, which eliminated the former Railroad Commission and placed the present board in charge of transportation and communication regulation with greatly increased powers and enlarged organization.

Chairman McLeod said that the annual expenses of the former three-member board were at the rate of $100,000 in the last year of its existence, whereas the expenses of the present five-member board totaled $163,000 in 1915. He pointed out that the present consolidation proposals do not affect the membership of the commission, since if it is not properly performing its functions the personnel can be changed either by gradual new appointments or by summary removal through the Governor and Council if cause for such action exists. So far as the consolidation of the Public Service Commission with either of the other two named is concerned, the effect would be to vest in the new board jurisdiction over two unrelated groups of activities. The board now has jurisdiction over 185 different companies with more than $2,000,000,000 capital and more than $400,000,000 annual income. "Such supervision comes pretty nearly being a man's job," said Mr. McLeod, "and I don't believe that any commissioners that may be appointed, no matter how able or wise they may be, are going to find that the supervision of that field is not sufficient to call forth every power and energy that they possess."

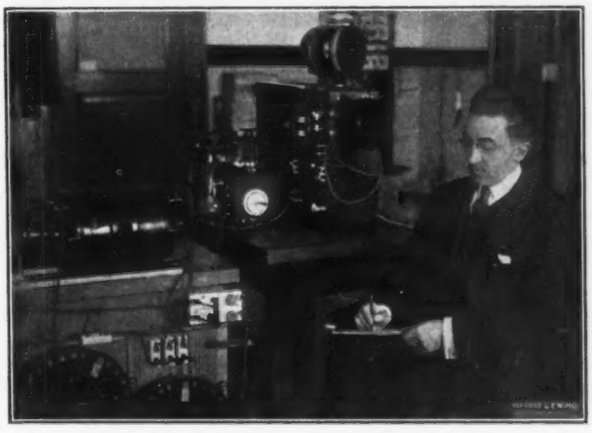
New Standards of Investigation Required

The whole scope of the commission's work was changed and enlarged tenfold by the creative act of 1913. This resulted from the increased authority granted over rates. The accounting and engineering departments formerly existed mainly to check up new security issues. This work is now incidental to the larger function these departments perform in connection with rate cases. Elaborate investigations going beyond the testimony and exhibits presented at the

public hearings are now required, as the public is not going in the future to accept the fiat of any two, three or five men that a certain rate shall prevail without knowing the facts and reasoning leading to the decision. The functions of the commission resemble those of a court, but they are more important, in the financial interests and policies affected and in their relation to the whole commercial structure of the State, than most of the matters that are heard before the highest judicial tribunal in the State. The difficulties of the commission, standing as it does between powerful opposing interests, are very great. Persons whose views in regard to any other matter under the sun would be of no interest to any human being frequently have their views on expert questions exploited in the headlines of the public press. It is under many trying conditions that the board has to perform its functions, but this is inseparable from any form of public service.

Radio Direction Finder

The Bureau of Standards has been investigating a radio-direction finder for some time, and has developed an instrument which is simple and practical and at the same time very efficient in operation. It indicates the direction of the source at the same time that the messages are being received, and while it is very sensitive to radiations in a given direction, it is less affected by atmospheric disturbances and interfering radiations from



RADIO DIRECTION FINDER

other directions than an ordinary receiving apparatus. The bureau has received messages by one or another of the three sizes of instruments that have been built from Philadelphia, Boston, Glace Bay (N. S.), Newcastle (N. B), New York, Norfolk, New Orleans, Panama, Key West, San Diego and Hanover, Germany. When atmospheric disturbances have been very pronounced on the large antenna at the West Laboratory, they have been very slight on the direction-finder apparatus, which is entirely indoors, having no antenna or earth or other outside connection.

This apparatus, according to Secretary Redfield of the Department of Commerce, appears to be well adapted to use (a) on merchant and naval ships to obtain the direction from any lighthouses or lightships that may be equipped with radio fog-signaling apparatus; (b) to obtain the direction of one ship from another at sea; (c) to communicate between ships or ship and shore stations irrespective of direction by reducing interference and atmospherics; (d) to use by the War Department in field service, as the receiving apparatus is portable, requires no ground or antenna and can be carried readily in a light vehicle or even by a single observer (e) to use by the Coast Guard Service to receive distress signals and locate the direction; (f) for use by the Bureau of Navigation to locate amateur or other stations that are not observing the radio regulations or are otherwise interfering with radio transmission of the government or legitimate commercial business.

Guarding Canadian Power Plants

Rapid-fire machine guns have been set in place and a large detachment of the next overseas contingent of Canadian troops is in camp at the Canadian power houses at Niagara Falls, Ont., because of the fear that German agents and sympathizers are operating along the Niagara frontier. No one is allowed to enter Canada over any of the three international bridges across the Niagara gorge except recognized tourists and others having American passports, and no one is allowed within almost half a mile of the Canadian power plants.

Orders have been issued by the executive officials of the Ontario power plants excluding visitors and tourists, although these great electric generating plants have long been a recognized point of interest to visitors to Niagara Falls. The recent attempted destruction of the Castner Electrolytic Alkali Company of Niagara Falls, N. Y., by dynamite has also had a depressing effect upon the management of American electric and electrochemical companies, and orders may be issued any day excluding visitors from these plants.

Never before has the Canadian Niagara frontier been under such heavy guard as at present. Armed camps have been placed at Bridgeburg, Ont., across the river from Buffalo, and at Niagara Falls, Ont.; a day and night guard patrols the entire 20 miles of border along the upper and lower rivers, and there are large detachments of troops at the Canadian approaches to all bridges and ferry landings and other points of entry. No one is allowed to photograph the camps, guns or other military protection, would-be transgressors being threatened with internment until after the war.

The beautiful grounds surrounding the plant of th Ontario Power Company are now occupied by troops in camp and with machine guns mounted for action. While a large percentage of the population of the border towns, villages and cities laugh at the extra precautions taken by the Dominion military authorities, there are those who are in daily fear of a German raid.

A strict censorship on the movement of Dominion troops is maintained, and any Canadian newspaper printing any such information is subject to an order to suspend until after the war. Colonel Rose and staff have arrived at the Canadian power plants from Ottawa to reinforce Major Engel in command of the contingent from Welland, St. Catharines and Thorold.

How Electricity Has Helped to Develop Rural Communities

An interesting commentary on the use of electricity in rural districts is contained in the testimony recently given by J. B. Early, a farmer of Grandview, Wash., in the Pacific Power & Light Company's rate hearing before the Public Service Commission of Washington. Mr. Early's ranch is in the irrigated district of the Yakima Valley, and he devotes his attention to fruit raising and the dairy business.

About twenty farmers living a mile south of Grandview on a tract of land somewhat too high to be irrigated by gravity flow from the government ditches in-

corporated the Grandridge Irrigation Association. The farmers pumped two years with gasoline power and found it unsatisfactory. The association then installed a 20-hp. motor, and now irrigates approximately 500 acres. Mr. Early stated that the construction cost to the association for its power plant amounted to $4.88 per acre, which was materially less than the $25 per acre which had been proposed by the government. It was impossible for the government engineers to give an exact figure on what the operating cost would be, but it was believed that it would not exceed $2.50 an acre. In addition to that, however, the farmers would have been compelled to pay a considerably higher interest charge because of the disparity in the cost of the pumping plants.

During the year 1914 the association spent $3.12 an acre for electrical energy and a man to supervise the plant and look after the distribution of the water. This man received $50 a month during the irrigating season. This plant operated under an approximate 25-ft. lift, including friction. The crops raised included alfalfa, fruit, corn, potatoes, cantaloupes, etc. Mr. Early emphasized strongly the desirability of electrical service from the point of view of continuity, particularly commenting on the practice of the company in maintaining stand-by steam plants.

In addition to the irrigation installation, Mr. Early has himself installed a 2-hp. motor that supplies energy for pumping domestic water for three families, milks his cows, separates the milk, does the washing and churning, turns the grindstone and performs other work. Mr. Early milks from twenty to thirty cows, using one man to superintend the milking machine. He farms 82 acres. Mr. Early previously operated a 2-hp. gasoline engine, which he discarded. The present electrical equipment, in addition to furnishing the domestic water above mentioned, furnishes water for about 100 head of stock. Mr. Early estimated his monthly bill for motor service to be about $5. He consumes about $2 worth of electrical energy for lighting each month.

The irrigation rate charged by the company is a fixed charge of $12 per year per horsepower plus a running charge beginning at 3 cents and dropping down to 0.5 cent, varying with the quantity used.

High-Rate Discharging of Lead Batteries

At the Feb. 23 meeting of the New York Section of the Electrical Vehicle Association Joseph H. Tracy, assistant chief engineer of the Electric Storage Battery Company, presented a paper on "High-Rate Discharging and Charging of Lead-Acid Batteries." In this paper he pointed out that by lowering the discharge rate of a battery each time it appears to be discharged, considerably more ampere-hours can be obtained from it than by continuing at the higher rate. The ability of a lead battery to discharge at high rates was demonstrated by short-circuiting a 70-amp. (four-and-one-half-hour rating) cell for several minutes, allowing a short period for recuperation, and then discharging again at a high rate. During each test the discharge current started at about 3000 amp. and dropped gradually. In discussing charging methods Mr. Tracy declared that the charging rate in amperes should never exceed the number of ampere-hours discharged from the battery at the time it is put on charge. When an ampere-hour meter is not used in conjunction with batteries, it was pointed out that the constant-potential system of charging furnishes a close approximation of the correct rate. Considerable discussion followed on the suitability of present forms of ampere-hour meters for vehicle service.

Widening the Activities of the Supply Jobber

Should Not a Jobber Be Encouraged to Carry Articles of Different Grades Provided They Meet Safety Tests?

In the February, 1916, number of *The Reminder*, published by the Electrical Supply Jobbers' Association, Thomas M. Debevoise, the counsel of the association, contributes an article dealing with the relationships that should exist between the manufacturer and the jobber and showing how, with proper support from the manufacturer, the electrical supply jobber might increase his field of usefulness.

According to Mr. Debevoise, "the last few years have seen many efforts to standardize electrical products and methods of distribution, and yet it is safe to say that up to this time only a beginning has been made. The reason is apparent. The industry is young and there are constant changes in the art which have in most cases a direct bearing on commercial questions. It is an encouraging sign that now, after years of economic waste, competitors in each branch of the industry have come to realize that solutions of their problems reached through co-operation will stabilize and strengthen the industry as nothing else can. This tendency is evidenced by the organization and maintenance of associations covering practically the whole field. The manufacturers and their engineers in some groups are studying the art, while the manufacturers and their sales managers in other groups are studying commercial methods. The central stations, the jobbers and the contractors have their organizations, and all of these co-operative bodies are learning to work together. Before long they will have a common clearing house for questions affecting more than one branch of the industry—as most questions in fact do.

"It would be interesting to consider whether the individual manufacturer has during the past ten years given as much thought to the changes in selling methods made necessary by the development of the industry as he has to changes in the art. We think at once of a few manufacturers who have been constantly improving their product but who have with equal consistency held fast to a sales policy adopted almost at the beginning of the business. Have they been right in this? Is it possible that any sales policy which was economically sound fifteen years ago can stand the changes taking place in a young and growing industry and still give the best solution to the distribution problem?

"The members of the Electrical Supply Jobbers' Association have in the past ten years learned that their continued existence as distributers depends absolutely on their furnishing to the manufacturers whose goods they handle the most economical means which the manufacturers can command for the distribution of their products. To meet this test they believe it is necessary for them to study their costs continuously, and for that purpose to adopt new methods of accounting, to make their office and sales forces more efficient, and to educate not only themselves and their employees, but even their competitors, to do business more economically and with less friction. As a result of this intensive work they have become more convinced than ever of the necessity of carrying out to the end their co-operative plans. They believe that jobbers can handle the distribution of electrical supplies better than the manufacturers can themselves; they know what it would mean to manufacturers to make hundreds of thousands of small deliveries all over the United States and watch and collect hundreds of thousands of small accounts—a task which they would necessarily have to perform if the jobbers were eliminated.

"And yet the manufacturers are not entirely satisfied with the work the jobbers are doing for them, and the jobbers in their turn are not entirely satisfied with the support the manufacturers are giving them. What is the trouble?

"Let us suppose that an old-line manufacturer of some one of the articles included under the term 'electrical supplies' finds that there has been placed on the market a new competing article of cheaper quality but one which will do its work at least for a time. He very soon receives a letter from one of his distributers saying that the competition of this new article has cut into the distributer's sales and that the distributer to meet this competition has been forced to reduce his price for the old-line article; that the distributer cannot continue to 'hold the bag'; that the manufacturer must share the loss by reducing his cost at least to some extent. What does the manufacturer do? He will start first on a price war with his competitor, largely, it may be claimed, at his distributer's expense. His next step will probably be to reduce the quality of his own product, but in any case he establishes a new price standard for it and starts a demoralized condition from which any real recovery is slow, if at all possible.

"The question is whether the manufacturer should not under such circumstances do one of two things, either continue the manufacture of his high-grade article without substantial reduction in price and manufacture a cheaper article to meet the new competition, or encourage—at least by not discouraging—his distributer to stock the new article.

"If a contractor goes into a distributer's store and, asking for the cheap article, finds that the distributer has nothing except the old-line high-priced article in stock, the contractor walks out again and gives all of his business to the small man, to whom the cheap article primarily appeals and whose business, often on an unsound basis, is built up through sales of that and similar products. If the distributer should place on his counter by the side of the old-line article a cheaper grade of the same manufacture, or the new competitive article, the contractor could then make his choice intelligently and his business would be saved to the distributer. The distributer would be in a position to talk quality in favor of the old-line article, which in many cases the contractor would then take rather than buy on the price basis alone.

"When we go into a hardware store for a saw or some other tool, we are offered articles at various prices. We may find that one manufacturer makes several grades, or that one manufacturer stands primarily for high quality, another for low price. We are much more apt to buy the high-priced article than we should be if one hardware store kept only high-priced goods and another low-priced goods. Then we should believe John Jones' statement that if we wanted a bargain—if we wanted to get something good cheap—we should go elsewhere.

"Can we not find a counterpart for the situation in the hardware store in almost every line of business which is old enough to be on a stable, permanent foundation? Is the electrical industry an exception? Should not a jobber be encouraged to carry articles of different grades, provided only that they meet safety tests? And if jobbers are encouraged to do this, will not the old-line manufacturers find that they will be best protected in the continuance of the manufacture of their high-grade articles by educating the public to look for high quality and by attempting through co-operation to raise the manufacturing standards of their competitors? Meantime will they not sell more of their old-line articles through the fact that their distributers will keep their customers instead of driving them to the sellers of cheaper products?

"The distributer who handles articles of high quality must reach and hold the trade, and it is very probable that many purchases are made on the price basis which would be made on the quality basis if the purchasers had not been discouraged in the first instance.

"It is human nature for us to try to get as much as we can for what we have to sell and to pay as little as need be for what we buy. We are attracted, therefore, in the first instance by the low prices, and if we are offered only fair quality at a low price and are not given an opportunity to see higher quality at a higher price, the manufacturer of the higher quality loses the sale, and we perhaps get what in the last analysis we do not want."

Organization the Way to Combat Competition

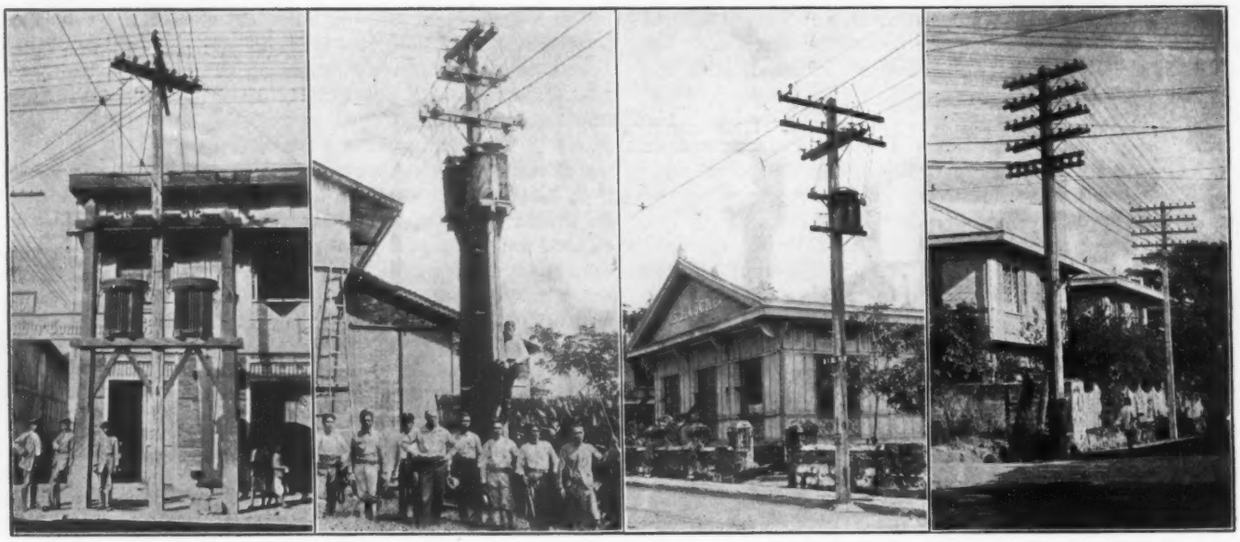
Speaking before the annual meeting of the Michigan Manufacturers' Association at Detroit, Mich., Feb. 17, Edward N. Hurley, vice-chairman of the Federal Trade Commission, voiced views on foreign trade which are widely at variance with those supposed to be held by all government officials and which should vitally interest every American manufacturer. He said in part:

"We are confronted with the anomalous fact that when we buy abroad we are at the mercy of the foreign seller and when we sell abroad we are at the mercy of the foreign buyer. In the language of the street, they 'get us a-comin' and a-goin.' ' And the reason is that the European industries are organized scientifically to capture foreign trade and to get all there is out of it, while we in America have suffered the consequences of this one-sided organization.

"In European countries manufacturers and merchants, aided by their governments, have developed a high state of efficiency which enables them to sell their goods in the markets of the world. Our buyers, seeking raw and finished materials in foreign countries, who formerly had a free competitive field from which to receive bids, now find that the great manufacturing industries have been formed into combinations or cartels, and, instead of receiving bids from several concerns, the American buyers now have to do business with central selling agencies, each representing a whole industry. But when the foreign buyer seeks material here he finds our unsystematized market—much to his own satisfaction.

"If the American manufacturer and merchant are forced to purchase materials abroad at a higher price because of the elimination of the old competitive system, is it fair that our business men engaged in the foreign trade should be subjected to the ruinous features of the old system here at home? When the foreign buyer seeks material here he has hundreds of firms to bid on his order. When the first bid is received back comes the cable, 'Your price is too high.' Then our business men start to cut prices in their endeavors to get the order, particularly if domestic business is dull. Right here I want to emphasize the fact that the owners of our vast natural resources are the trustees of the American people. When they sell their products at ridiculously low prices—the lumber, the copper and the coal that come from nature's storehouses—they are violating their trust, for ruinous trade spells a waste that brings nothing in exchange.

"At Frankfort-on-the-Main there is a combination—a family affair—which in normal times controls the world's market for copper and other metals. Time and again it has depressed the price of your Lake copper owing to the fact that this country produces two-thirds of the world's supply of that metal. The trick is performed by dealing with our producers as individuals and playing one against the other."



FIGS. 1 TO 4—INDUSTRIAL-TRANSFORMER INSTALLATIONS AND POLE-LINE CONSTRUCTION FOR RESIDENCE SERVICE IN MANILA

Electric Service in the "Pearl of the Orient"

How Labor, Climatic and Other Local Conditions in Manila, P. I., Affect Its Electric-Service Practices—Data on Load, Energy Consumption, Revenue and Operating Expenses

SOME engineers whose activities have confined their entire attention to developments in this country might, if they allowed their thoughts to turn to other countries, expect to find electric service in Manila, P. I., bristling with Oriental practices. Quite the opposite condition exists, however, for modern tendencies in operating practice are followed and National Electric Light Association line-construction specifications are carried out quite extensively there. This is not so strange as it may appear on first thought, because the electric-service system in and around Manila over an area of approximately 25 sq. miles is engineered and operated by the J. G. White companies of New York City. It may be pointed out, however, that, owing to inexpensive labor and climatic conditions, practices in Manila do differ from tendencies in this country to the extent that more station operations are performed manually and that pole lines must be constructed to withstand typhoons and destruction by insects such as white ants. Native labor used for unskilled operations costs about one-third the amount it does in the United States, but Americans, who are employed as heads of departments, watch engineers in the power house, etc., demand slightly higher salaries than in this country. Methods of interesting customers in the use of electricity do not differ greatly from those employed here. The effectiveness of flat rates is evidenced by the fact that the thatched bamboo huts of the poorer native population are often lighted by electricity. Electric fans are also connected on the flat-rate basis. In one campaign for this class of business eight regular employees of the complaint and collection department succeeded in selling 1000 fans in about three and one-half months, and during the same period local dealers sold 200. Lighting contracts during this campaign were secured at the rate of 800 a month. At present the electric-service company has about 11,000 flat-rate consumers. The principal industries served are tobacco and rope factories, but energy is also furnished for electric-railway operation. Tabulated data on the connected load, energy consumption and revenue per kilowatt-hour are shown herewith.

Nature of Pole Lines

Primary distribution circuits are operated at 3400 volts and the secondary lines at 224 volts. It has been found advisable to employ creosoted cross-arms, which have a life of about six years, because untreated arms last only about two years. Owing to the difficulty experienced with American and Australian wood poles, on account of rot or destruction by white ants, native wood called "ipil" is being used. This is very satisfactory except for its scarcity and consequent high cost. It is very hard and close-grained and is heavier than water. From past experience it has been estimated that ipil poles will last about twenty-five to thirty years. In 30-ft. lengths they cost about $18 apiece.

The company's standard poles, however, are made of concrete consisting of 1:2:3 gravel mixture. Some of the poles are shown in accompanying illustrations. They are reinforced with four ⅝-in. twisted rods laced together with No. 12 galvanized-iron wire. The poles have 12-in. square butts and 6-in. square tops, are 30 ft. long and cost $11.50 apiece. Several hundred of them are in service at present. The chief trouble with electric lines is caused by branches of trees being blown against them by typhoons or heavy winds, which frequently attain velocities as high as 100 miles per hour. Sleet and snow, which cause so much line destruction in this country, are practically unknown, however. No underground distribution is employed in Manila, principally because the city is subjected to frequent floods owing to being situated only slightly above tidewater.

To emphasize the development which has taken place in this community it may be pointed out that electricity was used for the first time in Manila in 1891, when Spanish engineers installed arc lamps energized by Brush arc machines to facilitate work on harbor improvements. Three years later incandescent lamps were used in the School of Arts and Trades. About the same time a third isolated plant was installed in a sawmill, and the proud owner is said to have placed an electric searchlamp in the mill tower to advertise his use of the new method of lighting. Meanwhile, a Spanish corporation, "La Electricista," was formed, and in 1895

energy was furnished, under contract with the city, for 140 arc and 1000 incandescent lamps. In 1903 this company and a Spanish street-railway company were consolidated under a franchise secured by Charles M. Swift

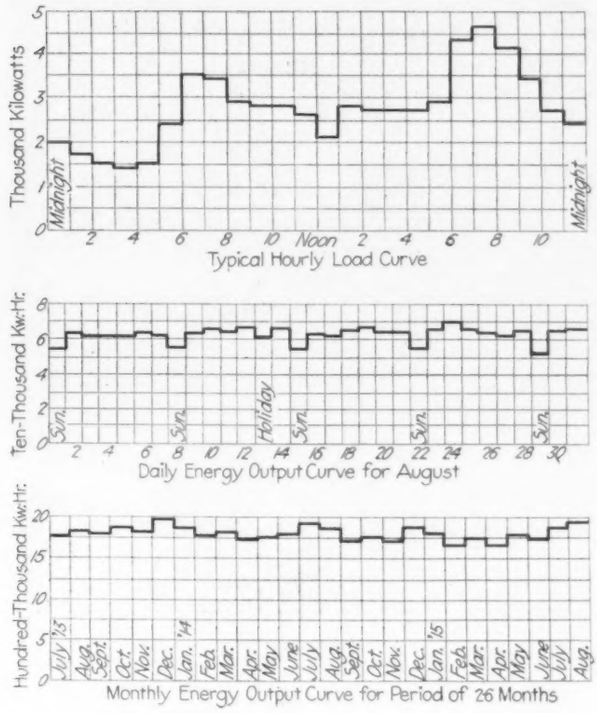


FIG. 5—CHARACTERISTICS OF LOAD AND ENERGY CONSUMPTION IN MANILA

of Detroit, Mich., into the present Manila Electric Railroad & Light Company.

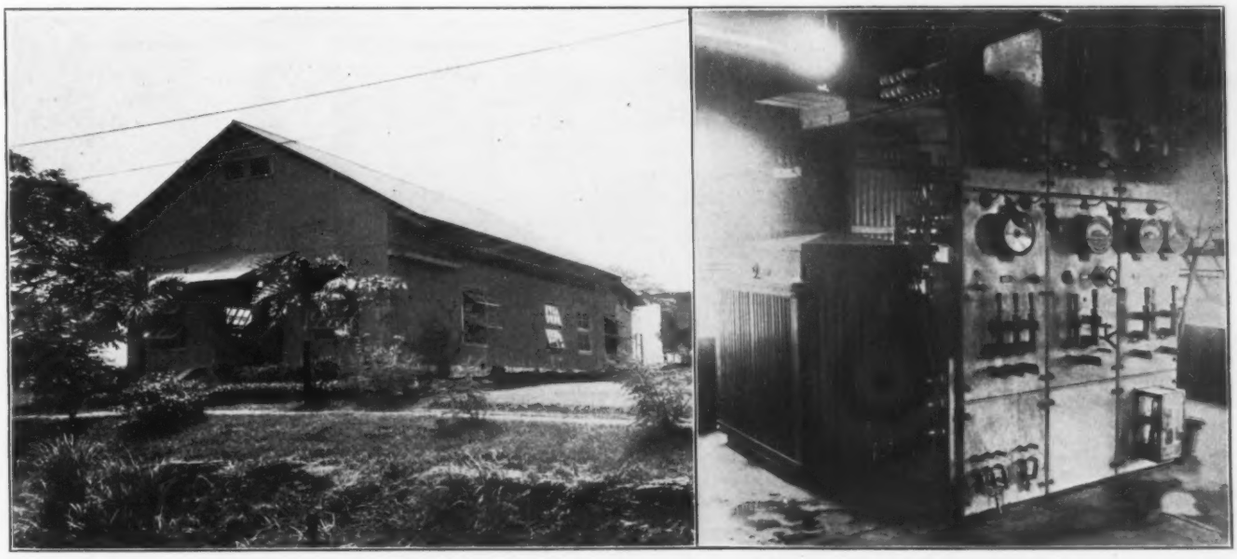
STATION-OPERATING METHODS

The initial generating station of the present operating company was completed in 1904 and included three 750-kw. Westinghouse-Parsons turbo-generators and eight 400-hp. British Babcock & Wilcox boilers. One year later an additional 1500-kw. unit, together with three 500-kw. and one 300-kw. rotary converter, was installed to carry the railway load. Since then other apparatus has been added, and the present equipment, as tabulated herewith, has a total rating of 10,000 kw.

Being adjacent to the Pasig River, a navigable stream, coal is received by barge and transferred to outdoor piles by a motor-driven Alliance conveyor. Chinese Fushun coal, containing 12,013 B.t.u. and costing $4.77 per long ton delivered, plus a special tax amounting to 50 cents a ton, is being used because the only other coal obtainable—Australian grade of higher heating value—is too expensive to handle and cannot be depended on on account of unreliable deliveries. Fuel oil has been also experimented with, the conclusion being that under present conditions the use of coal is more economical. Recently a franchise for water-power development on the Caliraya River, about 40 miles southeast of Manila, was secured, so that if this is completed the fuel problem will be practically solved, as the steam plant will have to be operated only as an auxiliary. Until then the bonus which is being offered plant employees for increasing the coal economy (outlined in the Sept. 25, 1915, issue of the ELECTRICAL WORLD) will probably keep the unit fuel consumption at a minimum, since only the first month's trial in-

TABLE I—CONNECTED LOAD AND ENERGY CONSUMPTION

Consumers served	17,776
Wattmeters connected	5,912
Distributing transformers connected	404
Kilowatt rating of distributing transformers	5,303
Motors installed	571
Aggregate horsepower of motors	3,295
Incandescent lamps connected:	
Commercial (in 16-cp. equivalents)	108,312
Municipal (in 60-cp. equivalents)	878
Arc lamps served:	
Commercial	246
Municipal	470
Sign lamps connected	2,914
Connected load (kw.):	
Alternating-current system	9,298
Municipal lighting	323
Maximum peak (kw.):	
Light and power (not including railway load)	3,640
Railway	1,800
Total (including railway load)	5,130
Energy generated annually (kw.-hr.):	
Total	21,789,900
For railway operation	9,654,680
Gross annual income (not including railway)	$814,578
Unit gross revenue (cents per kw.-hr.):	
Generated	6.67
Delivered	9.37



FIGS. 6 AND 7—A CORRUGATED SHEET-METAL SUBSTATION AND SWITCHING EQUIPMENT USED BY MANILA ELECTRIC RAILWAY & LIGHT COMPANY

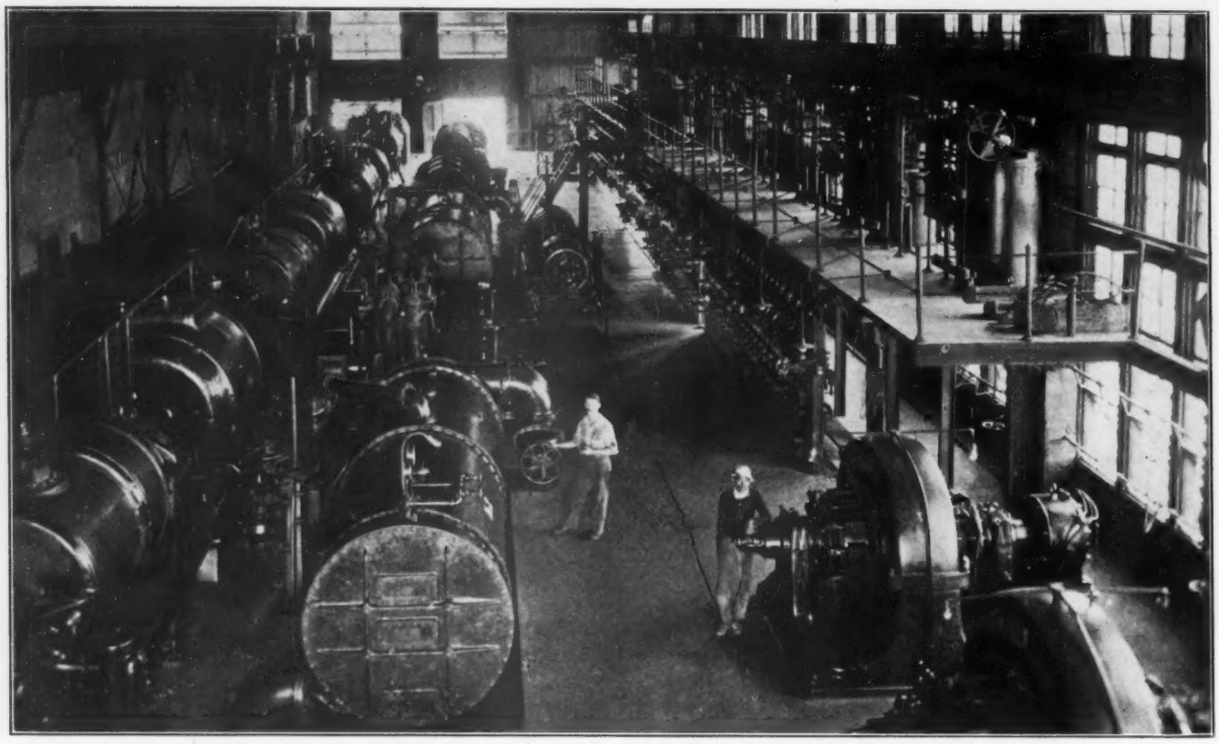


FIG. 8—PART OF THE 10,000-KW. GENERATING EQUIPMENT, CONDENSERS AND SWITCHING APPARATUS

duced a saving of about $425. Half of this was distributed among the employees, but this additional compensation is made contingent on good operation.

In addition to employing this method of permitting its employees to share in the benefit of any improvements they may produce, the Manila company is conducting welfare work similar to that of progressive companies in the United States. Regular classroom instruction for the native employees has been established, oral instruction having been found the most satisfactory method of teaching Filipinos. The most common languages spoken among the company forces are English, Spanish and "Tagalog," the native dialect. The organization of baseball teams and of bands has also been effective in producing pleasant relations between the employees and the company. The company engages a doctor to care for sick and injured employees.

The personnel of the executive and operating organization is as follows: Charles M. Swift, president; Frederic H. Reed, vice-president; John H. Pardee, vice-president; C. Nesbitt Duffy, vice-president and general manager, and J. C. Rockwell, manager of the electric department.

EQUIPMENT OF MANILA RAILWAY & LIGHT COMPANY

Boiler Plant.—Twelve 400-hp. Babcock & Wilcox hand-fired boilers, operating at 175 lb. pressure and 150 deg. superheat and discharging smoke into a 175-ft. round steel stack 9 ft. in diameter. Two Goubert closed-type feed water heaters are employed, the water being forced through them by two duplex pumps. Injectors are provided for auxiliary service.

Prime Movers and Generators.—Two 750-kw., one 1500-kw. and one 2000-kw. Westinghouse turbo-alternator and one 2500-kw. Allis-Chalmers unit. All condensers are of the surface type, the complete equipment, including circulating and vacuum pumps, having been furnished by Alberger & Company. The railway equipment includes four 500-kw. rotary converter sets and one 1000-kw. motor-generator set, both of Westinghouse design. One 300-kw. rotary converter is installed in a substation at Fort McKinley. The same substation includes equipment for distributing alternating current for light and motor service at the local military post and in the city of Pasig.

Exciters.—Two 37.5-kw. and one 50-kw. Westinghouse exciter, one 100-kw. Allis-Chalmers unit, all directly connected with induction motors.

TABLE II—CLASSIFIED OPERATING EXPENSES

Generation		0.908
Coal	0.715	
Oil and waste	0.030	
Wages	0.110	
Water	0.007	
Station repairs	0.001	
Steam equipment repairs	0.040	
Electric equipment repairs	0.005	
Transmission		0.024
Distribution		0.319
Operation	0.149	
Maintenance	0.170	
Overhead	0.085	
Service	0.004	
Transformer	0.005	
Meters	0.064	
Miscellaneous	0.012	
Utilization		0.110
Incandescent lamp renewals:		
Commercial	0.010	
Municipal	0.055	
Repairs to customers' installations	0.022	
Commercial		0.253
New business		0.052
Advertising	0.032	
Salaries	0.018	
Wiring and appliances	0.002	

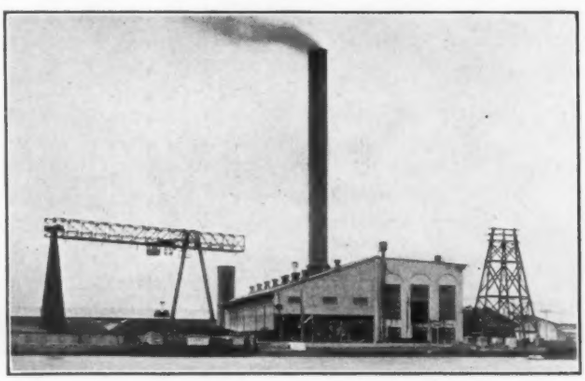


FIG. 9—EXTERIOR OF GENERATING STATION, SHOWING COAL-HANDLING EQUIPMENT AND RIVER-CROSSING STRUCTURE

The Friendly Power of the Public Press

BY EARL E. WHITEHORNE

Looking back across the last five years of commercial effort in the electrical industry—particularly the local work by contractors and central stations—on the far side of the perspective we see an idea, a condition that has grown and grown, until to-day it has become the very background of our business. It is the idea of publicity, not in its commonly intended sense, but rather in the thought that both prosperity and progress come directly from the friendship of the people. As a policy it has become quite universally accepted, even though it seems not to be practiced and applied to a very great extent. But it is recognized that these friends must be won in greater numbers than is possible by normal individual contact. What shall be done? It is a matter that concerns us all, and luckily a recent experience presents the answer and has just administered a stimulus that deserves a quick response. This article presents the thought in concrete form and cites some interesting evidence.

THERE is nothing harder, nor more helpful, for a man to do than to detach himself in theory from his environment and ask himself: "If I should start all over, knowing what I do, how would I go about it?" Just for fun, and for the profit that will come of it to every one of us who turn the fancy over in our cerebrums, let's picture some good central-station manager who sits him down to make an acid test and asks himself: "If I should start again to sell electric service to the city, what would be the most important thing to do?" We will find his answer for him.

Sitting back and looking at a modern city—looking at it as a great diverse, potential market for electric service—ask the question: "What's the best way to sell electric service?" Obviously the best way to develop this great market is to make all the people want to use electric energy for every kind of application. But to make them want these things you must first make them realize that they would enjoy the use of them. Again, to make them realize this, you must first build up an intelligent appreciation of both the utilitarian and the comfort values of these applications of electricity. And to bring the public to this point of actual appreciation requires a long and gradual process of development in every individual mind.

With every man and woman there are these successive steps that must be climbed before the trick is turned. First you must be heard, then you must secure a voluntary attention, then awaken interest, then inspire confidence in the truth of what you are telling, then instill desire and eagerness, then make the sale. The stages of this conversion may be compassed in five-minute talks or spread over five long years of steady influence, but the process is the same. Before the friend is won and the new customer secured the impulse of your educational effort must overcome not only the natural inattention and forgetfulness of the public and its lingering reluctance to adopt new habits—the inertia of the mass—but the inherent fear that something new and more modern *must be* more expensive. And so this is no small and simple problem.

The man who wants to know what it is best to do has

THIS GIVES AN IDEA OF HOW THE NEWSPAPERS BACKED ONE ELECTRICAL CELEBRATION—READING COLUMNS, PICTURES AND DISPLAY AS WELL AS ADVERTISING—JUST PART OF THE ELECTRICAL PROSPERITY WEEK CLIPPINGS. WILL THE "FRIENDLY POWER OF THE PRESS" WORK FOR YOU IN YOUR COMING WIRING CAMPAIGN AND THROUGHOUT THE YEAR?

two distinct things to consider, two different phases of the matter. There are two separate problems involved. How to interest the people in the individual applications of electric service in the home, the store, the office and the factory—that's one of them. The other is how to bring the public to accept sympathetically the public-service idea and become accustomed to the use of public utilities of every kind, as offering just so many opportunities to better their condition of living and increase their comfort and well-being. And of the two thoughts, surely this, the second, is the greater and the more positively effective for the whole electrical industry, and therefore it should be foremost in the mind of this imaginary central-station manager whom it pleases us to pit against the abstract problem of what to do. It should be foremost in *your* mind.

In every city there are several utilities that are equally interested with you in propagating this great public-service idea and achieving its universal approbation and acceptance. There are, in addition to the central station and the contractors and dealers who align with it, the gas company and the water service and the telephone and the street railway and the newspaper. Every one of these enterprises is a utility. Every one of them is dependent on the public favor and support. Each one prospers as the community grows and broadens and gives it patronage. All are one in their relation to the public and their interest in the education of the people to acceptance of the modern service idea. If the community is unprogressive, the utilities must stagnate; but if the spirit of better times is strong among the people, then they want more comforts in their daily lives. They want and they buy more service from the gas, electric, water, telephone and railway companies. They want and they enjoy more of everything. They do not clamor for more news in this same sense, but as the business of the city grows, so grows the newspaper, and everywhere we find the press a champion of every movement to advance the interests of the city. It is the function of the press. And so the newspaper is one with all the other agencies of public service in everything that makes for progress and for growth. The men behind the newspaper, the telephone, the water-works, the street railway, the gas plant and the electric station should get together and work in eager harmony to spread this gospel that supports them all.

Three months ago there occurred a thing unprecedented in this industry or any other. There was a national celebration of "Electrical Prosperity" in which not only central stations, contractors and dealers joined together in a week of festive doings, but the public also took a hand and entered into the observance of the event to an extent that none of us believed was possible. You know the details, and there would be no point in again rehearsing them. But perhaps you have not realized that of all the influences that brought this thing about the newspapers stand foremost, next to the Society for Electrical Development that fostered it.

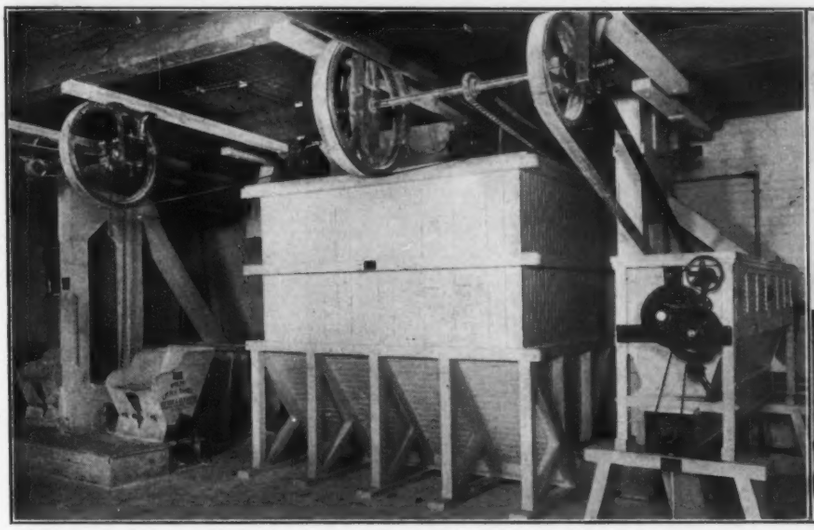
It was the newspaper that told the story to the public, that impressed it with the fact that this "week" was not just a selfish advertising project that the local central station was attempting to "put over." The newspaper was interested in the movement for two reasons. First, it was a most progressive enterprise, a story strong in human interest to all people; it was news. And, second, it brought an opportunity to the newspaper to render service to the electrical interests and enjoy a proper profit through its advertising columns. But the interesting point is this: among 124 letters that have come to the Society for Electrical Development from newspapers that participated in the campaign, there are not one but many cases where the newspaper is seen to have immediately recognized the merits of the idea and, in spite of having received practically no added advertising from local electrical firms, lined up behind the project and supported it because it was a good thing, because the newspaper knew that greater use of electric service by the people would immensely benefit the city as a whole. Naturally, across the country the enormous volume of publicity that was secured through newspaper co-operation was repaid to the papers most profitably by increased advertising utilized by central stations, contractors and dealers in their big local campaigns. Thus, among the countless columns of news display that ran that week on the strength of extra space sold special supplements from four to sixteen pages, solid reading matter, pictures and displays, all were featured in the effort to advance the desire for better living through the wider use of electric service—in other words, to boost the public-service idea. The newspaper stands equipped and ready to become the central station's greatest influence for the education of the local public sentiment, not alone for cash paid down, but because it, too, is a public utility and eager for the prosperity that will come to you all with the spread of the public-service gospel.

For the newspaper is a booster. This is a fact that you already recognize, even though our history shows that many newspapers have been the persecutors of utility corporations. That this is so no more paints them all or permanently black than the fact that one such corporation has been convicted of corruption forever damns the entire industry. And no measure will so quickly bring about an understanding and an active and constructive co-operation between the press and all the other local public-service agencies as will just such a "family" affiliation as you have it within your power to form. For the central station that is harassed by press and politicians is invariably the company that has built no bond of sympathy and understanding between itself, the other utilities and all the people.

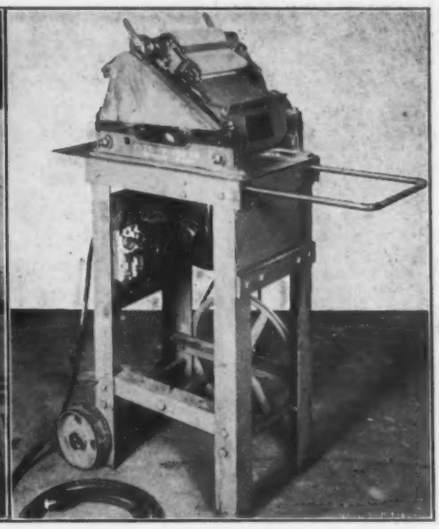
The newspaper is ready to ally itself with the other public servants in the great and profitable work of educating the community to appreciate these blessings of our modern life. I have read these 124 letters which the society received from editors and business managers of newspapers about Electrical Prosperity Week. They are interesting and full of evidence of this thing. Some tell of active co-operation for the electrical interests—how the central station and dealers joined together in big advertising displays and how the newspaper contributed big spreads of news and pictures. Some tell how they appealed to the electrical people but could get no co-operation at all. Many letters state that though they could secure no added advertising they were glad to play the "week" up strong and boost the idea, for they thought it was a good thing. Almost every one of them indorsed the repetition of the celebration this year, and said they would support it with enthusiasm. And there you have the attitude of all the press—a willingness to get behind any good thing for the city and to help any movement that will help itself.

And so the manager who sits back to consider what he should have done, what he can do now, if he will, to develop his commercial opportunity, must think about these things and recognize that first of all must come the spread of that great idea—public service. The rest—the actual selling—will develop on its heels. But for the kind of plans that we are forming now-a-days—plans for a national "Wire-Your-Home Month" this spring, for another "Electrical Prosperity" success next winter—we need friends. We need publicity. We need the newspaper, the friendly power of the press. We need the popular appreciation and approval, and it is time that all the public servants should agree and work together to secure it and sustain it.

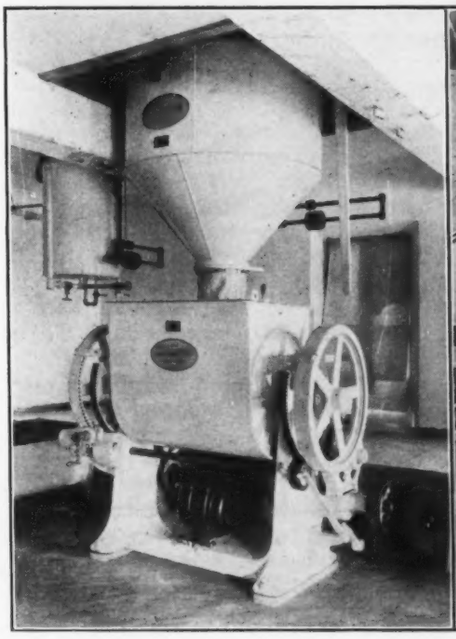
An Electrically Equipped Bakery at Boston Producing 50,000 Loaves of Bread Daily



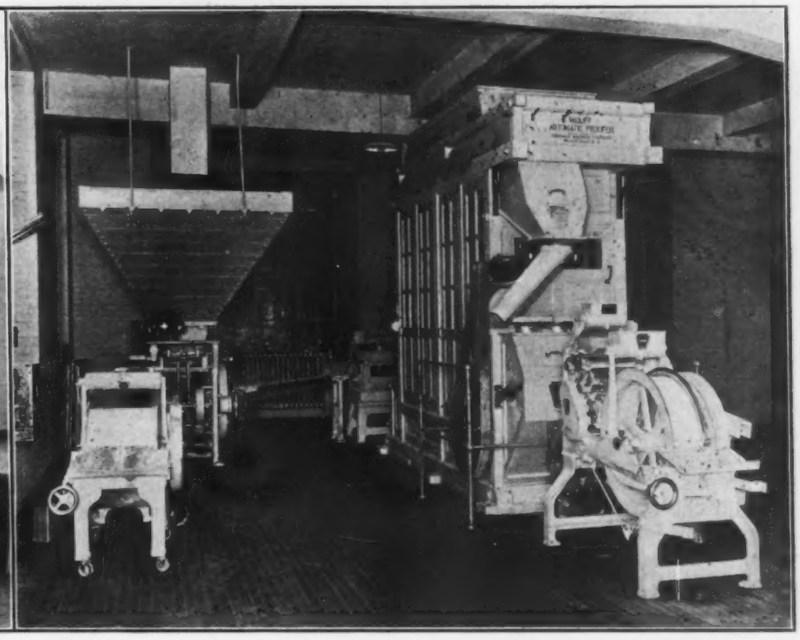
FLOUR SIFTER AND BLENDER DRIVEN BY ONE 5-HP. AND ONE 3-HP. MOTOR



CRESCENT-ROLL MOLDING MACHINE (¼-HP.)

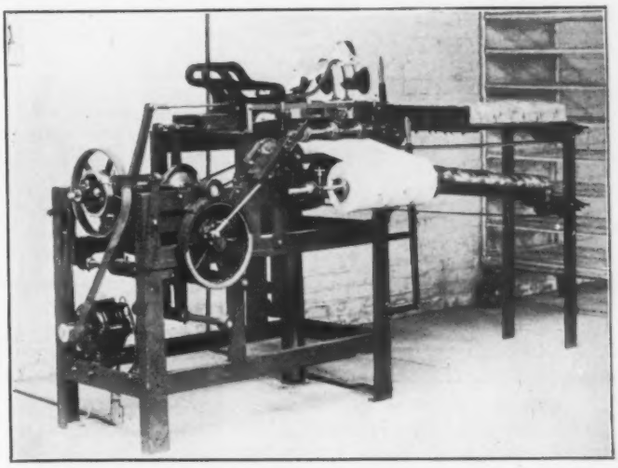


45 HP. IN MOTORS DRIVES THE TWO MIXERS



THE AUTOMATIC "PROOFER" WHERE THE LOAVES RISE FOR TEN MINUTES

A 15-hp. elevator lifts the flour to the sifting and blending machine on the third floor, which removes any lint, lumps and foreign particles. Automatic scales deliver batches of predetermined weight to the dough mixers, where water, yeast, lard and milk are added, and when thoroughly incorporated the mixture is delivered into long troughs where it rises five hours. All air entering the mixer room is washed and filtered. From the 3-hp. dough divider the loaves pass to a 2-hp. rounding-up machine to be rolled and kneaded. Thence they pass for ten minutes through the proofing machine (1-hp.), after which a molder further shapes them and then deposits them onto five-loaf pans. After being moistened in the live-steam room they are ready for the ovens. The finished product is finally sealed in an air-tight package by the motor-driven wrapper, which has an electric heater attachment. The plant, which is operated by the Grocers' Baking Company of Boston, is served through a special 150-hp. transformer by the Edison Electric Illuminating Company of Boston. All machines in the bakery are individually operated by three-phase, 220-volt motors. Motor-driven belts convey the loaves from one machine to the next, the transfer operations being effected without contact of human hands. The bakery equipment here described and pictured was installed by the Petri & Jones Company, Boston.



THIS MACHINE WRAPS THE FINISHED LOAVES IN WAXED PAPER, AN ELECTRIC HEATER SEALING EACH PACKAGE AS IT IS WRAPPED

FIGS. 1 AND 2—THE OLD AND THE NEW LIGHTING OF ST. GEORGE'S EPISCOPAL CHURCH; NOTE ABSENCE OF FIXTURES IN FIG. 2

Lighting a Church Auditorium Without Fixtures

Illumination of St. George's Episcopal Church, Newburgh, N.Y., by Gas-Filled Tungsten Units Concealed in Deep Boxes That Are Built Into the Side Galleries

BY A. L. POWELL AND R. B. THOMPSON

ST. GEORGE'S Episcopal Church, Newburgh, N. Y., which dates back to 1815, is an interesting and attractive building of solid stone construction, designed along simple yet impressive Colonial lines. The auditorium proper is rectangular in shape and measures 73 ft. long by 40 ft. wide. At the two sides and at the rear is a balcony with a sloping floor about 9 ft. wide. The front edge of this balcony is 9 ft. above the floor. The ceiling over the balcony is flat, while the central portion is slightly arched, rising to a height of 28 ft.

The posts which extend from the first floor to the balcony and from this to the ceiling are cylindrical with very plain bases and capitals. These and all the rest of the woodwork or trim are painted a pure white. The pews are also white with mahogany edging. The sanctuary and choir furniture is of dark oak, the floor is of red and white tile, and the walls are finished in light cream. The ceiling, which is painted a flat white, is unbroken save for four plaster rosettes, two of which conceal ventilators.

The system of electric lighting formerly employed is well shown in the night view (Fig. 1). Outlets were

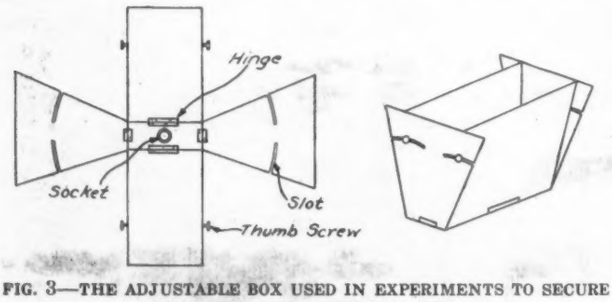


FIG. 3—THE ADJUSTABLE BOX USED IN EXPERIMENTS TO SECURE DESIRED DISTRIBUTION OF LIGHT

placed two on each of the columns midway from the balcony rail to the ceiling, and also at intervals of about 4 ft. in a row along the front edge of the balcony about 1 ft. above its lowest point. The fixtures consisted of curved brackets of ⅛-in. brass tubing, about 1½ ft. in length, with a very small canopy. Clear carbon and graphitized lamps of the 50-watt and 60-watt sizes were used, and the "shade" was a fluted cone of glass which gave no diffusion, had no redirective properties, and was not large enough to conceal the lamp filament in the least. There were altogether sixty-two units, giving a power demand of approximately 3.1 kw., or, since there were 2900 sq. ft. to be lighted, over 1 watt per square foot of floor area.

In addition to these electric fixtures there were a number of gas outlets, relics of a bygone day. These outlets were of two types—an upright standard of pipe with a "squat" open globe placed midway between each of the two columns on the balcony rail, and a two-arm pendent fixture of more ornate design with similar globes suspended by a short bracket from the face of the balcony. These gas fixtures were never used and were merely retained as a matter of sentiment and for possible use in case of emergency.

Needless to say, the lighting above described was not satisfactory; it was, moreover, costly for the effects secured. The fixtures were inartistic and not harmonious with the architecture, making the church look very untidy. Glare was extreme, for there was a multiplicity of unshielded light sources in the field of vision. The distribution of light was uneven, and dense shadows were produced beneath the balcony. In fact, as was characteristic of many of the earlier installations of electric lighting, the whole combination appeared to be a haphazard jumble of fixtures put in place merely as an unavoidable necessity and not as part of the structure. It served its purpose, however—that of supplying adequate light—but in a very unsatisfactory manner.

INDIRECT SYSTEM WITH FIXTURES FIRST PROPOSED

Within the last year it was decided to remodel the lighting system and to install something thoroughly up to date which would make the church comfortable and bring out its full beauty. The matter of the design of the new installation was put in the hands of the authors with this instruction: "The general requirements are that the church proper be lighted by indirect means and that the design of fixtures be in keeping with its architecture."

After inspection of the building and taking the necessary measurements, a set of recommendations was drawn up for lighting the church with standard indirect fixtures. Casings were chosen which harmonized with the architectural decoration. Three relatively large indirect units were to be installed symmetrically in a row down the center of the ceiling, and several

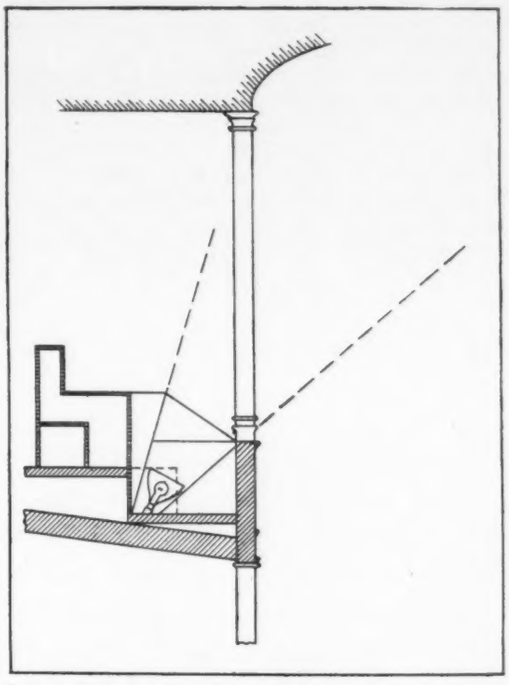


FIG. 4—ONE OF THE REFLECTOR UNITS IN PLACE

smaller fixtures of similar design were to be suspended below the balcony. It would have been a simple matter to have installed this system, and the cost of the fixtures was reasonably low.

This report was presented to the committee having the matter in charge, but was rejected on the ground that to be in perfect harmony with the period of the church there should be no such large bowl fixtures as those recommended. If any fixtures were used, it was claimed that the characteristic motif should be the candlestick. After talking the matter over it was decided that the building should be well lighted without any fixtures being visible.

OBJECTIONS TO COVE LIGHTING AND FLOOD-LIGHTING

Cove lighting was next suggested and measurements were taken of the narrow cornice which extended around the central portion of the ceiling. This was found to be far too small for the concealment of lamps and reflectors. To use such an arrangement it would have been necessary to build a false molding. This would have meant considerable expense. There was but little rise to the peak, making it very likely that the ceiling would have appeared streaked or spotted when lighted. The cove-lighting idea was therefore abandoned.

There have recently been a number of very effective flood-lighting installations, using focus-type tungsten lamps with parabolic reflectors. Comparatively narrow beams of high intensity are directed from a distance on the objects to be lighted, It was suggested that such devices might be used to illuminate the church, locating the projector units close to the floor of the gallery and directing their beams on the ceiling. It was realized that the distance was far too short for the system to be effective; nevertheless, eight units of the 250-watt size were experimented with. Although these were chosen to give a fairly wide beam, they still produced a series of very bright spots on the ceiling, and even when placed close together the ceiling was far from uniformly bright. Frosted gelatine screens were placed across the openings of the projector units to diffuse the light somewhat, but even this did not produce the desired effect.

Since it was seen that projector units concentrated the light too strongly, the next attempt was to use standard deep-bowl industrial reflectors, of both the steel and mirrored-glass types, giving various distributions. These could be placed so as to illuminate evenly the central portion of the ceiling, but light escaped at such angles as to be annoying to persons sitting in the gallery. Considerable flux impinged on the side walls, presenting a very unattractive appearance.

EXPERIMENTAL BOX REFLECTORS

From this experiment it was evident that satisfactory effects could be produced with a very deep reflector

By means of a portable photometer, which had been calibrated before the test, measurements were recently taken of illumination on a plane 30 in. above the floor in various parts of the church proper. The maximum illumination was 1.55 ft.-candles, the minimum 1.27 ft.-candles, with an average for the area not beneath the balcony of 1.4 ft.-candles. Directly under one of the ceiling lamps over the side aisles the intensity was 1.5 ft.-candles; midway between the two side lamps, 0.6 ft.-candle. While, as pointed out elsewhere in the article, the total power taken by the installation has been somewhat increased, it is felt that this extra operating outlay is justified. The entire equipment is now controlled from a switchboard mounted in an adjoining room, where dimmers are provided so that the intensity of illumination may be varied to conform with various parts of the church service. Energy to light the church is supplied by the Central Hudson Gas & Electric Company, the wiring and construction work was done by Hewitt & Warden, local contracting engineers, and the photographs were obtained through the courtesy of M. Hannon of the Central Hudson electric company.

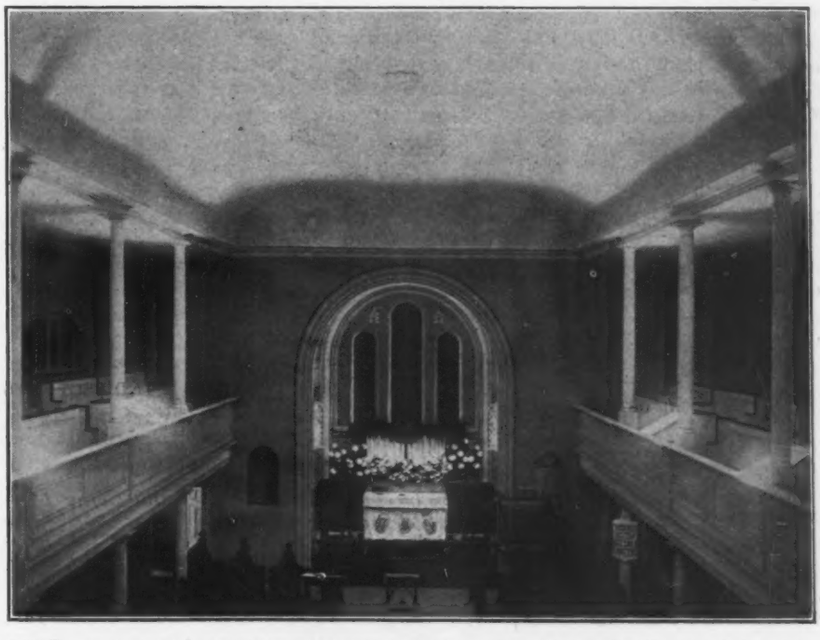


FIG. 5—ST. GEORGE'S CHURCH LIGHTED FROM UNITS HIDDEN BEHIND GALLERY RAILS

so designed that it would give the proper angle of cut-off. An adjustable box 3 ft. deep, of sheet iron, painted white on the inner surface, was constructed as shown in Fig. 3. The sides, being hinged, could be set at any angle and held in place by the thumb-screws working in the slots. It was then a very simple matter to find the exact shape of reflector desired.

Six units of the design which gave the best results were constructed and installed. Sections of the seats in the first row of the balcony were removed and these reflectors boxed in, as indicated roughly in the section (Fig. 4). The permanent boxes are so constructed that persons sitting behind or alongside of them are not annoyed in the least by stray light, and they are deep enough so that when viewed from the opposite balcony no glare is visible. In the entire auditorium there are only two seats, one at each corner of the front row of the rear balcony, where a person, when standing, can see a lamp.

To make the combination more efficient, deep-bowl, porcelain-enamel, intensive-distribution steel reflectors are placed about the lamps, which are 500-watt Mazda type C units.

To provide illumination below the balcony, opalescent-glass deck lights, nine in number, are held in place flush with the ceiling by simple brass bands. These dishes are 14 in. in diameter and 3⅜ in. deep, of a decoration which blends well with the Colonial architecture. Sixty-watt lamps are placed in recesses above them.

It has been suggested that a warmer tone of illumination than that given by the unmodified gas-filled lamps is desirable, and to secure this effect gelatine screens of very light amber are available to place across the mouths of the large reflectors.

The sanctuary is illuminated by a row of lamps placed about the upper part of the arch, hidden from view by the molding. There are two windows of art glass which are seen projecting from the side walls. These are illuminated from behind by groups of relatively low-candle-power tungsten lamps.

The old fixtures were removed and the woodwork retouched where it had been marred by the numerous old fixtures. The church, which now appears as shown in Figs. 2 and 5, presents a most attractive appearance. The illumination is even, very well diffused, and of a pleasing character. It will be noted that the ceiling is very evenly lighted and yet none of the light strikes the side walls. There is nothing to mar the simple beauty of the structure. The shadow effects produced by sunlight have been duplicated, for the direction of light is the same and the artificial light sources are in approximately the same relative positions as the windows.

The total power required has been increased somewhat over that formerly taken, yet for the splendid results secured the slight additional expense certainly appears to be warranted. The lamps are now all controlled from a modern switchboard installed in an anteroom and connected in series with a standard dimmer for reducing the intensity of illumination during those parts of the service when this is deemed necessary.

How Harmony Was Brought to Wilkes-Barre

An Interesting Story of a Co-operative Plan That Has Accomplished Big Things for the Contractors and for the Central Station Alike

BY FRANK E. HOLLIS

Commercial Manager the Wilkes-Barre Company, Wilkes-Barre, Pa.

WE have all heard of the numerous attempts that have been made by central stations to eliminate all petty quarrels and price fights from their local family of electrical interests. We have read of many endeavors to weld together by some co-operative plan all the electrical contractors in the districts served, so that the spirit of harmony, peace and friendship might abide throughout the locality and bring with it satisfaction and profit to the contractor as well as increased revenue for the central station.

While this idea has been a goal which all far-thinking managers have had in view, it does not require much search to discover the records of many failures, for rarely has the effort yielded the results expected of it. Disappointment has come either owing to the inability of the central station to realize that an electrical contractor is entitled to very full consideration when prices on wiring or appliances are to be established, or oftentimes because the contractor himself expected too much of the central station, in consideration of the fact that additional revenue is derived from new consumers which his efforts help to put on the company's lines.

These conditions have entered largely into bringing the downfall of many eager harmony plans in many communities. Central-station officials too frequently look upon the electrical contractor as a workman who should pay tribute to the company because their service offers him an opportunity to obtain a good return on his investment and work. They forget that to offer him encouragement and try to create an attractive condition will cause others to come into the field and add their efforts to the load, to everybody's benefit.

BEST CONDITIONS IN WILKES-BARRE

Here in Wilkes-Barre it is very gratifying to us to be able to state that for the past four years we have had in operation what we feel to be an ideal situation in this respect, for we can honestly say that we now count the electrical contractors in this city as our most effective salesmen.

It has been an interesting development, which began in 1911, when this co-operative plan first presented itself to E. A. Wakeman, general manager of the Wilkes-Barre Company. After giving the matter serious consideration he decided that the apparent merits of the idea warranted giving it a thorough trial. But the outlook at the start was anything but encouraging, for the electrical contractors were not easily persuaded. They ignored the scheme, deeming it a detriment to progress and without good quality; yet in a measure this attitude on their part was natural, for prior to that time salesmen in employ of the central station had vexed the dealers in many ways. Their methods of salesmanship had not been over-friendly, and frequent cases of underselling and closing deals at any cost had really annoyed and antagonized the contractors in their attitude toward the Wilkes-Barre Company.

So the plan seemed destined to be short-lived, for it really looked empty to the majority concerned, since in their eyes the electrical salesmen in the employ of the

company were constantly trespassing. A thorough investigation soon revealed this source of trouble, however, and prompted the initial step toward success, and most of the friction went with the change. The entire force of appliance salesmen, who apparently had been responsible for many of the hostile views, were eliminated from the service, while the company's decision not to continue in the business of wiring likewise made a deep impression and brought the first real progress toward the upbuilding of a "family spirit."

In the fall of 1913, shortly after the writer took charge of the commercial department here, we inaugurated a campaign to secure controlled flat-rate lighting, and it was at this point that we were enabled to prove to the entire satisfaction of all the electrical contractors that we desired to encourage the co-operative plan and secure their affiliation to the utmost. Every electrical contractor in Wilkes-Barre accepted our invitation to attend the meetings which were called to arrange the wiring prices, and the success of this campaign, in which hundreds of house wiring and fixture contracts were secured and all without exception turned over to the dealers for execution, thoroughly awakened their enthusiasm and gave this company more than 100 "galvanized boosters" for central-station service.

It has taken four years of patient effort, with not a little discouragement at times, to educate the consumers of our growing community to support adequately the electrical contractors who have had the courage to venture into the retail merchandising business and risk their earthly belongings by displaying "everything electrical" in central city locations. "Watchful waiting" was blackballed from the date of origin, and the increased activity which was substituted gradually began to make an impression on the cash registers of the contractors and the coffers of the company's stockholders. A tour of the electrical shops in Wilkes-Barre today tells the story of this successful alliance, which now pays big dividends without detriment.

We have within the shadow of our office building seven electrical shops of good size, centrally situated and carrying thousands of dollars' worth of electrical goods, all featuring display rooms unexcelled, I believe, anywhere in America and a credit to Wilkes-Barre and the industry. Seven more stores can be found within a mile radius and these likewise specialize in pushing the electrical business. The stores mentioned are all exclusive electrical shops which sell nothing but electrical goods, there being no side lines whatever. Add to these fourteen all the other stores having electrical departments operating at a profit, and some idea of the dividends this proposition pays can be appreciated.

MERCHANDISING LEFT TO DEALERS

The Wilkes-Barre Company has remained steadfast to the original agreement regarding the sale of electrical appliances, and so close has the writer drawn these lines that with the exception of a few domestic irons not a single electrical appliance has been purchased or sold by the Wilkes-Barre Company in two and one-half years. All inquiries for appliances and fixtures are in every case referred to the dealers, and the same rule applies to wiring and motor business, where the dealers are called upon to sell the machines as soon as power contracts are closed by our power salesmen. Our sales are limited to a few of the small-size Mazda lamps for residence consumers, when list prices are always maintained, and a few domestic irons. All lamps for commercial or factory use are sold by the contractors.

Many central-station officials have always believed that they can procure more profitable returns and increased output by selling appliances at cost, but we feel that we have disproved this theory. For when a central station cuts off the source of income from the contractor by cutting prices, so that the dealer can no longer show a profit on sales, the dealer must do one of two things—either retire from business or compete with the central station. Either of these courses spells a loss to the central station, and nothing would dismay us more than to learn that the fourteen electrical contractors of Wilkes-Barre intended to retire from busi-

EFFECTIVE CO-OPERATION WITH THE ELECTRICAL CONTRACTOR AT WILKES-BARRE, PA.—A JOINT ELECTRIC SHOW ARRANGED BY THE WILKES-BARRE COMPANY IN WHICH EACH CONTRACTOR INSTALLED A BOOTH, SOLD APPLIANCES AND TOOK CONTRACTS

ness. If this should come about, nearly 125 "boosters" for our output would be eliminated, there being about this number engaged at the present time. For us to secure the services of these 125 men would bring a gigantic increase to our pay-roll, with a loss in volume of new business unless we likewise continued to operate the fourteen showrooms. In other words, fourteen showrooms scattered along our lines can "pull" more business than one central-station display room, and each group in its location is able to gather in much new business without cost to the central station.

Being familiar with the conditions in his locality, each contractor is a particularly effective agent. When the central station forces the dealer to compete it also obliges him to sell isolated plants in order to survive and overcome his loss through losing profits on appliances. In this field the contractor is able to install complete equipments and figure on further requirements, and this is a big item, especially if the dealer has been long established, for he is constantly consulted by factory owners and others regarding such installations and he can do much good or harm on such occasions. Yet

THE WILKES-BARRE CONTRACTORS IN ROTATION USE THE CENTRAL STATION'S SHOW WINDOWS FOR THEIR DISPLAYS

here in Wilkes-Barre, where every one of our contractors has become a friend and booster for the central station, only one isolated plant has been installed along the lines of the Wilkes-Barre Company in the past three years. And during 1915, with aid of the contractors, we were enabled to close down three isolated plants, these being supplanted with central-station drive.

Joint Use of Display Room

In the last two years we have been able to introduce a few ideas which have added no little to the success of the plan. In one case we put at the disposal of the dealers one of our spacious front show windows, as well as space in our office for the featuring of their displays and demonstrations where our consumers would see them more quickly when paying their bills. This offer was unanimously accepted, and each week in turn one contractor installs his display, with all joining forces for a joint display and demonstration in the holidays. During these displays we close as many sales as possible, turning in in full all money received from sales for the exhibiting contractors, as well as furnishing their representatives with the names of "prospects" which may be developed. In this manner we are always exhibiting in our display room "everything electrical," including the latest thing in electric-heating contrivances, as well as electrical fixtures, portables and other specialties which are certain to appeal to the "hard-to-please" purchaser. We place no restriction on these displays, all dealers being allowed to feature any article using central-station output.

Electrical Prosperity Week found us very active, our observance being in the form of demonstrations and instructive displays of appliances by the electrical contractors. Individual booths displaying everything pertaining to electricity attracted thousands throughout the week and aided greatly in adding many revenue producers to our lines. Several hundred dollars' worth of devices were sold. The writer donated the use of an entire building and all the electricity required by each exhibitor to demonstrate and operate his appliances. We also erected booths, which were handsomely decorated, and wired the whole building inside and out, giving the surroundings a carnival appearance decked in multicolored lights and bunting. We likewise defrayed all the expense incurred for advertising and all other incidentals. That the capacity of our spacious showroom was inadequate for this event was a tribute not only to the demonstration and exhibit itself but also to the harmonious agreement we have in vogue; and great credit is due the dealers who are so fast educating housekeepers and business men alike in Wilkes-Barre to use electricity as a means of conserving their time and energy.

Proving the Pudding

I sincerely believe that there is nothing more profitable to-day in central-station work than linking forces with the contractors. We certainly can recommend it to all. It gives the busy men in central-station life time to devote to other and more urgent matters than trying to straighten out an alleged overcharge for wiring for a consumer or adjusting a complaint over an appliance sale. It eliminates many labor troubles between the central station and wiremen, because the wireman is not likely to demand as much from a contractor as he might from a corporation. It lessens operating expense and saves much money in bookkeepers' and collectors' salaries, for many people seem to feel that the central station should be their banker, carrying through everything; the dealer does not give this impression, and therefore his accounts, we have found, are paid more quickly. From a business standpoint it is a good thing all around, for all. The majority of the contractors here now own the property and buildings they occupy, and the policy has caused the Wilkes-Barre Company to double its load since 1910. The year 1915 saw a net gain of 1747 hp. in motors added to our lines, with 90 per cent of our consumers using electric irons, approximately 2500 irons being sold in the last eighteen months to our consumers.

That the contractors appreciate our co-operation and its effect in eliminating all friction and bringing about such a pleasant and profitable condition is very apparent, and the officials of this company count most of the contractors as personal friends. We are always invited to their social gatherings, which are frequent, and also are welcome guests at their association meetings, and we are never forgotten when outings, banquets or smoke talks are arranged. The writer is constantly on the look-out for ideas which might be applied to our mutual benefit, and occasionally we add a link to our strong chain in this way. All summed up, in brief, this plan has proved to be a sensible business deal, carried out by business men in a business way, and it has overcome for us all those perplexing obstacles that heretofore were considered impossible to avoid.

THIS SIGN AT MONTEREY, CAL., BRINGS A MONTHLY REVENUE OF $4.90 ON A FIVE-YEAR CONTRACT

THE PROGRESSIVE MUNICIPALITY IS OFTEN A GOOD PROSPECTIVE CUSTOMER FOR ELECTRIC SIGNS OF THIS KIND

Co-operative Sign Selling on Pacific Coast

How Nineteen Central-Station Companies in California Have Added a Total of $33,200 per Year to Their Lighting Revenues by an Easy-Payment Plan

THE easy-payment plan for selling electric signs is being applied very successfully by a number of central stations on the Pacific Coast under a co-operative agreement between the sign manufacturer and the lighting companies. The advantage of the plan is in the combination which enables manufacturer and electric company to do only that part of the work for which each is best equipped, thereby accomplishing the ultimate result at the least cost. At the same time it seems to simplify the proposition for the consumer by introducing no third party into the transaction so far as he is concerned, for the consumer deals only with the electric company, paying the installments on the sign as an addition to his regular monthly bills.

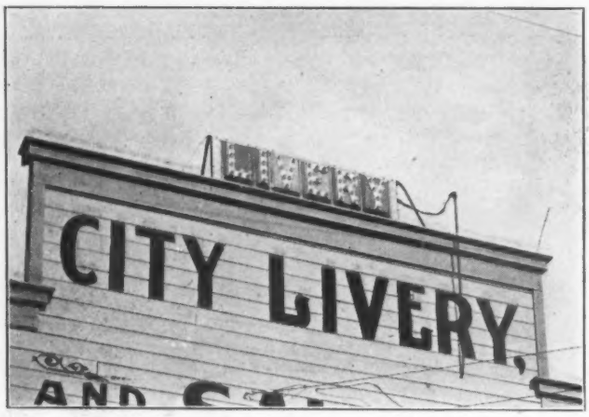
This plan, which is so fast developing the sign load possibilities in the Pacific Coast field, has been developed by T. W. Simpson of the Federal Sign System (Electric), who inaugurated the campaign and has been directly responsible for its operation in so far as it affects the manufacturer. Based on this experience of his in Pacific Coast cities, Mr. Simpson believes that any company which does not realize on electric-sign business at least 25 cents per year per capita of total population in the territory served has not adequately developed this source of revenue. So far some nineteen companies in California have added $33,200 per year to their lighting revenues by the plan described.

As examples of what can be done, Mr. Simpson points to the case of the Western States Gas & Electric Company, which realizes about $10,000 a year from the sale of energy for 193 electric signs in the city of Stockton, Cal., with a population of 16,000. The results that have been attained throughout California are particularly good, probably considerably better than have been secured thus far in other territory, but they serve to show what can be done by the co-operation of sign manufacturer and electric company. It was under this plan that a large percentage of the new business in these towns was "signed up."

The agreement under which this work has been carried on provides for the canvassing of a stipulated field within the power company's territory by salesmen in the employ of the electric-sign manufacturer. The contract under which the signs are sold allows the purchaser to pay for the sign in installments extending over a period of from three to five years, which will be

IN MANY WESTERN AND SOUTHERN TOWNS AWNINGS OR GALLERIES ARE POPULAR—THE PHOTOGRAPH SHOWS AN ELECTRIC SIGN ADAPTED TO THESE CONDITIONS

THIS MERCHANT—WHO WOULD HAVE ORDINARILY USED A 100-LAMP SIGN—WAS INDUCED UNDER THE CO-OPERATIVE PLAN TO OPERATE A 1000-LAMP DISPLAY



A LIVERY-STABLE SIGN THAT EARNS $38 A YEAR

paid to the lighting company as an addition to his monthly bill for electrical energy. The contract is either for a flat rate or for metered service, as the lighting company prefers. It provides that the lighting company will maintain sign flashers and renew burned-out lamps, and in some cases the contracts include the washing of signs and even swinging them to and from operating position and turning the current on and off. The contract is made subject to the approval of the lighting company, so that the latter has an opportunity to reject it if the customer's credit is not considered good.

The electric company buys the signs from the manufacturer on terms of 25 per cent at date of invoice and the balance in twelve monthly payments without interest, subject to a cash discount of 5 per cent on unpaid balance should this be liquidated entirely at any installment date. This plan means that the sign manufacturer practically finances the investment by offering the power company the advantage of term payments. These terms are not so liberal as the power company extends to the customer, but are so arranged that the payments by lighting company to manufacturer come fairly close to the gross monthly payments which the lighting company receives from the consumer and which cover both the installments on the sign and its monthly operation.

The electric company pays the manufacturer no commission on signs sold and makes no merchandising profit other than a nominal interest charge. The manufacturer, on the other hand, agrees to circularize any "prospect" list furnished by the lighting company at least four times a year, to supply electrotypes for newspaper advertising, and to take back from the lighting company all standard parts of signs which are returned on the default of a customer. In this case the sign company allows the lighting company the original net price less one-half the total amount of the gross payment made by the defaulting customer on account of the original purchase price, monthly lighting and maintenance bills, etc., provided that the lighting company assigns to the manufacturer its rights to prosecute the customer.

In the Pacific Coast field the sale of electric signs has become a highly specialized work, and it has seemed best to employ only high-class salesmen who have had careful training in this particular line. The policy which has been found most successful in the small towns is not at all suited to cities with a population of 40,000 or more, however, and it is believed that before a campaign of this sort is started a special study should be made of each particular community canvassed, particular attention being given to proper methods of advance publicity, and that only intensive methods should be employed. The usual electric-appliance selling arguments must be supplemented by definite figures as to the results that can fairly be expected by the individual purchaser and by the community as a whole, and the sanction of such bodies as the Merchants' Association, etc., is worth taking pains to secure. The terms of the contract must be liberal so that the plan will be within the reach of the small establishment and so that it will appeal to the proprietor as comparable, financially, to other advertising schemes. For example: It is manifest that a two-hundred-dollar investment is inadvisable for many merchants who would nevertheless see their way clear to an agreement under which they would spend $8 or $9 per month in order to secure an increase in their sales.

A typical case which might be taken as an illustration of the average electric sign-proposition in one of the smaller California cities might be analyzed as follows:

Initial cost of sign and accessories	$151.00
Lamps	23.08
Freight and erection	34.00
Investment	$208.08
Interest	20.80
Total	$228.88

Dividing this total by thirty-six, the monthly payment on a three-year contract is found to be $6.36, in addition to which the monthly bill would amount to about $4.66 for energy and 88 cents for lamp renewals, making a total monthly payment to the lighting company of $11.90.

On a contract of this sort the lighting company's profits for the three-year period should be figured as follows:

Gross income in contract (36 × $11.90)	$428.00
Cost of installation	208.00
Balance	$220.00
Additional profit in initial lamping	7.00
Total	$227.00
Deduct lamp renewals at cost	21.60
Net return for electricity supplied	$205.40

CENTRAL-STATION EXPERIENCE

The actual experience of the various companies that have been selling signs under this plan is interesting. In 1912 the Coast Counties Gas & Electric Company placed twenty-five signs on its lines in the little towns of Watsonville and Hollister, Cal., and up to date the company has experienced only two defaults. In these two cases, however, it was able to place the signs in the service of the successor in the business which followed the default, so the signs were out of service only thirty days. S. Waldo Coleman, president of the Coast Counties Gas & Electric Company, states that the experience of his company has been so satisfactory that it is arranging to have its territory covered once more, in the expectation of placing twenty or twenty-five more signs on the lines.

The Sierra & San Francisco Power Company and the Coast Valleys Gas & Electric Company have had similar success, it is reported, their campaign dating from the latter part of 1912. The defaults in the Coast Valley division amounted to three and those in the San Joaquin division to four, corresponding on an average to one default per year for every twenty signs in the service. E. F. Baker, assistant general manager, reports the results as entirely satisfactory, and that the company will continue its sign solicitation on this co-operative plan on a permanent basis, the sign company's representative covering the territory once each six months.

The San Diego Consolidated Gas & Electric Company

had so completely canvassed its city that in 1915 it already possessed 300 electric signs, most of these being placed on a two-year combination sale and rental plan. This total, it is claimed, makes that city foremost in the United States for number of electric signs per unit of population. However, by adopting the co-operative sign plan on the basis of five-year contracts, the company was successful in adding fifty more electric signs to the lines in a period of three months, so that San Diego to-day boasts of 350 electric signs with a census population of 48,000.

The co-operative sign sales plan is now in effect over the entire system of the Pacific Gas & Electric Company (except the San Francisco district), and this company has encouraged the load by the recent filing of a 3-cent rate for electric signs placed upon a flat schedule from dusk to midnight, which averages 182½ hours per month over the year, all signs being controlled by time-switch or watch service. In return for the encouragement provided by this low rate, the electric-sign manufacturer co-operates by equipping signs with 10-watt lamps instead of 5-watt lamps, as would be customary if the rate were maintained at the usual unit value.

MARKETING ELECTRICITY

A Department on Selling Service and Widening the Use of Electrical Energy

House-Wiring Survey and Appliance Sales Campaign at Duluth, Minn.

Cost Figures and New-Business Results of a Three Months' Effort in the Zenith City, Where 80 per Cent of the Dwellings Are Already Wired

Officials of the Duluth Edison Electric Company take pride in a campaign recently conducted to place more electric appliances on the company's lines, because of the fact that the campaign was begun and completed in the short space of three months' time, so that the desired end was well accomplished and yet the commercial sales staff was kept away from its ordinary work for only a short period.

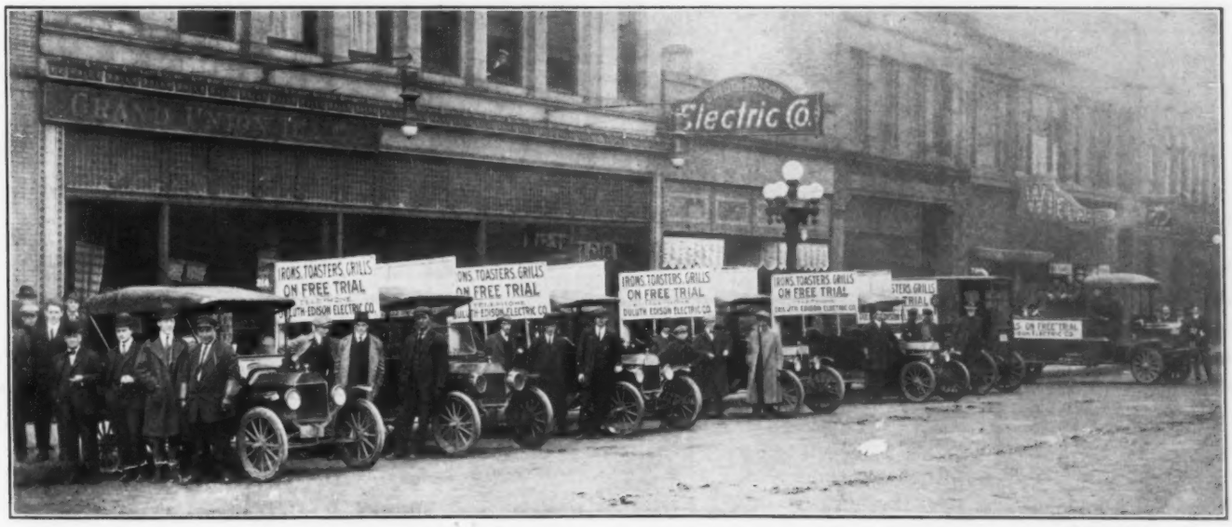
No startling methods or particularly original ideas were used, but some results were obtained which, from the central-station point of view, were most satisfactory. Moreover, an absolute check was kept on every phase of the work and the company was able to say at the end of the three months' period exactly what the results had been, what the expense had amounted to, and what the net profit to the company would be. In addition, much other information of a kind sure to be useful in future campaigns was obtained by the company's canvassers.

THE PRELIMINARY NEW-BUSINESS SURVEY

As a preliminary to the appliance campaign and to the activities of a new commercial service department in general, the company made a "survey" of the city to determine what the possibilities for additional business of various classes were. For this purpose the city was divided into thirty districts, and ten men (in six weeks' time) called at every house and filled out on a printed form a complete record of all the electric appliances in use, the number of electric lamps and their

TABLE I—STATISTICS OF THE DULUTH NEW-BUSINESS SURVEY

Residence houses called on	16,000
Residence houses using electric light only	12,000
Residence houses using gas or oil with electricity	250
Residence houses wired but not using electricity	530
Business houses called on	2,400
Business houses using electric light only	1,700
Business houses using electricity with gas	340
Business houses not wired	60
Average wattage residence lamps installed	37
Average wattage per residence customer (lighting only)	548
Average wattage per residence customer (lighting and appliances)	636
Number irons out at time of survey	6,000



AUTOMOBILES AND CREWS READY FOR A MORNING'S DELIVERY OF APPLIANCES IN DULUTH CAMPAIGN

C. S. Form No. 7.

TRIAL AGREEMENT

DULUTH EDISON ELECTRIC CO. Date_____

Gentlemen:—

Without obligating myself to purchase, I request you to deliver to me at _____ one _____ which I agree to use, on your circuit, during a trial period of _____ days.

On or before _____, you will be notified whether or not I desire to purchase the above appliance.

Should I desire to purchase the above appliance at any time prior to _____ I understand the price of same will be $_____, and further that if it is desired, satisfactory terms can be made.

Yours very truly,

Above appliance received _____ Customer

Delivered by _____

DUPLICATE TO BE RETURNED TO C. S. DEPT. Representative

THE COMPANY'S RECEIPT FOR APPLIANCE DELIVERED

C. S. Form No. 8.

PURCHASE AGREEMENT

DULUTH EDISON ELECTRIC CO. Date_____

I hereby agree to purchase from you _____ receipt of which is hereby acknowledged, and to pay you therefor $_____ Payment to be _____

I agree to be responsible for said appliance, until paid for, in not to exceed the purchase price of $_____. I also authorize you to render bills, according to the above, with my monthly Electric Billing.

_____ Customer.

Address _____

Receipt of $_____ as full/partial payment, according to the above, is hereby acknowledged.

ORIGINAL TO BE RETURNED TO C. S. DEPT. Representative

PURCHASE AGREEMENT SUBMITTED ON SECOND VISIT

wattage, whether the house was wired or not, whether electric light was used exclusively or not, etc. The results of this survey revealed the impressive fact that 80 per cent of the houses of Duluth are wired. Partial details of the returns are given in Table I.

In addition to these figures, a great mass of information was obtained concerning present customers and possibilities for future new business, and also a sense of direction was secured as to what class of new business to go after first and most profitably. The cost of making this survey and details concerning it are shown in Table II.

TABLE II—COST OF DULUTH SURVEY

Population of Duluth	100,000
Total calls made	18,911
Average number of calls per day per man	39.48
Total man days	579
Total cost of wages	$1,093.75
Wage cost per call, cents	5.78
Office expense of survey	$347.97
Office expense per call, cents	1.84
Manager, stationery, printing, carfare, etc	$1,080.20
Cost of above miscellaneous per call, cents	5.71
Grand total cost	$2,521.92
Total cost per call, cents	13.33

TABLE III—APPLIANCES MOVED DURING CAMPAIGN

	Irons	Toasters	Grills	1-Qt. Water Heater	Toaster Stoves	Radiators	Twin Glowers	Hot Plate	Total
Total trials	1426	594	28	1	19 2 2 1	3	1	1	2078
Sold to and including July 31	1107	168	5	0	16 1 0 0	0	0	0	1297
Balance	319	426	23	1	3 1 2 1	3	1	1	781
Returned	280	416	23	1	2 1 0 0	2	0	1	726
On trial Aug. 1	39	10	0	0	1 0 2 1	1	1	0	55

TABLE IV—TOTAL HEATING-DEVICE CAMPAIGN EXPENSE

	Total Expense	Cost per Appliance Sold, in Cents	Cost per Appliance Placed on Trial, in Cents
Wages (including portion of clerical force)	$1045.54	80.60	50.31
Wagon signs	32.75	2.52	1.57
Advertising	504.52	38.90	24.25
Photographs	8.50	0.65	0.41
Manager's expenses	71.35	5.48	3.43
Prizes	32.00	2.47	1.54
Automobiles	592.50	45.70	28.51
Stationery	67.65	5.20	3.25
Display cards (showroom)	14.40	1.12	0.69
Carfare	45.00	3.47	2.16
	$2414.21	186.11	116.12

Appliance Campaign

A campaign for selling appliances naturally followed the survey study, for it was evident from the foregoing that there were greater possibilities of increasing the load by inducing people who were already customers to use more energy than by wiring additional houses, since such a large percentage of the latter were already wired. Accordingly, a three months' house-to-house canvass was made, dividing the city into the same thirty sections and assigning two men to each section. These solicitors worked on a straight salary basis, averaging $55 a month. They were young fellows without experience whom the company picked up, giving them a four-days' schooling and then turning them loose on the city. After that they had meetings once a week for talks on salesmanship.

These solicitors induced customers to take one or more household devices and to give such appliances a ten-day trial, at the end of which they could buy the piece for cash or on a monthly time basis and be billed for it with their lighting bills—or the company would take the appliance back. Upon accepting an appliance for trial, the customer signed the "trial agreement" card shown herewith, which was merely the company's receipt for having delivered the device. This work of delivery was accomplished with four Ford automobiles, two men

TABLE V—CONDENSED REPORT ON IRONS AND TOASTERS

	Irons		Toasters		Total	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Placed on trial	1426	....	594	....	2020	100.0
Sold	1107	77.7	168	28.3	1275	63.2
Returned	280	19.6	416	70.1	696	34.4
On trial July 31	39	2.7	10	1.6	49	2.4

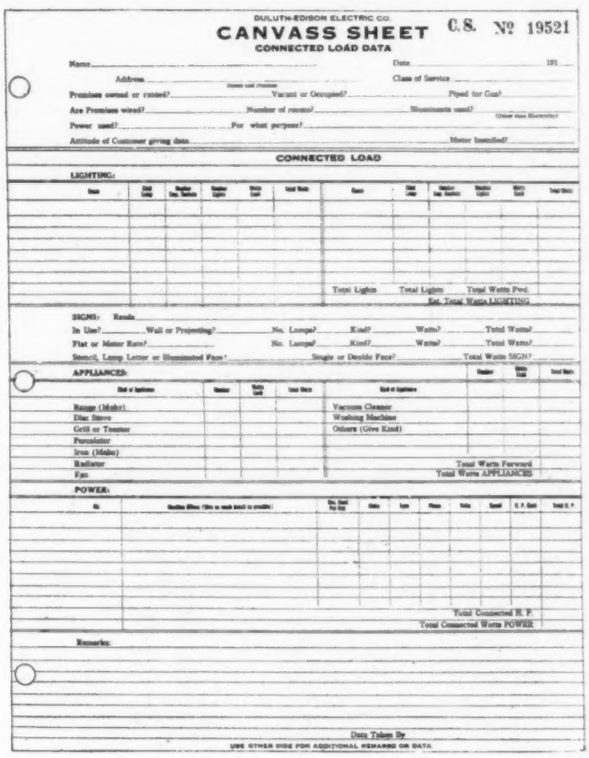
TABLE VI—VALUE AND PROFITS FROM APPLIANCE SALES ATTRIBUTABLE TO HEATING-DEVICE CAMPAIGN

	No. Sold	Sale Value	Cost Value	Profits
Irons	1107	$3578.45	$2182.44	$1396 01
Toasters	168	429.40	342.70	86.70
Toaster stoves	16	69.26	50.88	17.38
Grills	5	15.00	10.70	4.30
Copeman range	1	45.00	45.00	0.00
Total	1297	$4137.11	$2631.72	$1504.39

being assigned to each machine. This plan proved to be an economical way of handling the distributing problem, on account of the extended area of Duluth, which is about 25 miles long but very narrow.

When the ten-day trial period had expired, a second call was made by the solicitor, who either sold the appliance or took it back. At this time the customer signed the purchase agreement reproduced herewith, if the article was purchased on a time basis. If the customer was still undecided at the end of ten days, the trial period was frequently extended another ten days.

In Table VI the item of advertising expense, amounting to $504.52, was made up on the basis of 80 per cent of the total advertising cost of the company for the month of May and multiplied by three for the total. Inasmuch as the usual cost of advertising of the company has in the past amounted to approximately $300 a month, it would seem almost fair that the amount above this figure only should be charged against the



DULUTH-EDISON ELECTRIC CO.

CANVASS SHEET C.S. № 19521

CONNECTED LOAD DATA

Name ____ Date ____ 191__

Address ____ Class of Service ____

Premises owned or rented? ____ Vacant or Occupied? ____ Piped for Gas? ____

Are Premises wired? ____ Number of rooms? ____ Illuminants used? ____

Power used? ____ For what purpose? ____

Attitude of Customer giving data ____ Meter Installed?

CONNECTED LOAD

LIGHTING:

Room	Total Lamps	Number Gas Burners	Number Lights	Watts Each	Total Watts	Room	Total Lamps	Number Gas Burners	Number Lights	Watts Each	Total Watts

"proposal" is filed away in the office as a follow-up and office record. The work-order sheet then goes to the superintendent, who sees that the work is executed. On the back of this work-order sheet are ruled spaces for a tabulation of the materials taken out, the materials brought back, and the time.

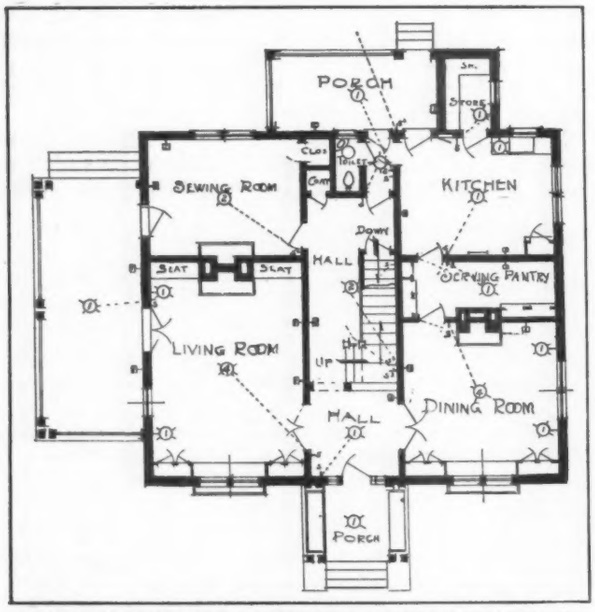
When the job is completed and inspected, this work-order sheet is returned to the office. There the time and materials are priced and totaled, and the actual cost of the job is figured on the sheet. The estimated costs are also taken from the "estimate book" and entered on the finished work order. The office then has a complete record of the job, and this is filed after the items are entered on the ledger. The follow-up sheet is destroyed as soon as the customer pays his bill. All original estimates are filed in a special estimate book, so that they can be referred to at will.

Each proposal, it will be noted, has a number. This is the "proposal number" and not the "job number." The jobs have numbers assigned to them as they are secured, and at any time it is easy, therefore, to determine the ratio of jobs secured to the number of bids made during the year. "Time and material" jobs are handled in much the same way, except that no sheet goes to the customer. The orders are printed on green paper, making them distinctive.

A Liberal Supply of Wall Outlets for the Home Convenient

In planning a new home or in the wiring of an existing dwelling too much stress cannot be laid upon the practical necessities of at least one baseboard outlet for each room. Indeed, as pointed out by A. E. Holman in the monthly bulletin issued by the Southern Public Utilities Company of Charlotte, N. C., unless the agent who sells an electric heating or cooking device to the housewife secures also her consent to install a proper receptacle to operate the appliance, the latter is likely to be put aside and forgotten—except in neighborhood gossip, when she will be sure to say she "has one but never uses it."

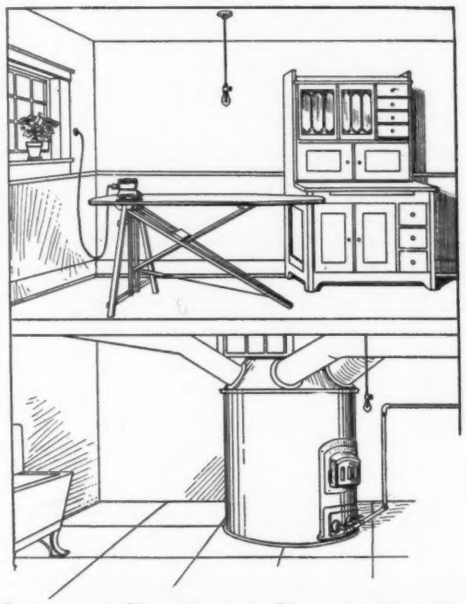
The accompanying plan shows an actual layout as installed in an average home served by the lines of the above company in which adequate provision was made for baseboard outlets. This dwelling cost complete $4,800, of which $180 covered wiring, fixtures and equipment—only 4 per cent of the total cost. In addition to the adequate lighting of all the rooms, it will be observed that baseboard receptacles are fairly well scattered. Those in the dining-room and pantry are daily conveniences, while a liberal supply in the bedrooms provides for reading lamps, heating pads, milk warmers, fans, etc.—all utilities that have every-day service. In the sewing-room a wall receptacle takes care of the iron for pressing, while the sewing-machine motor is operated from a baseboard outlet. The lamps in the garage are controlled from the house as well as from the door of the garage. In the laundry receptacles are available for the washing machine, iron and fan. The dwelling illustrated is that of Dr. A. L. Smethers at Anderson, S. C., built from plans by Casey & Fant.



EACH TINY RECTANGLE INDICATES A WALL OR BASEBOARD RECEPTACLE FOR FUTURE ELECTRICAL APPLIANCES

A Two-Room Permanent Installation as House-Wiring Entering Wedge

To give prospective customers a foretaste of the convenience of electric service, and to provide for one or two rooms an initial installation which shall be permanent so that it can be added to without changing when the customer is later ready to have electric service extended throughout his dwelling, the Union Gas & Electric Company of Cincinnati, Ohio, is conducting a special nineteen-dollar house-wiring campaign, which has met with immediate success.



FOR $19, PAYABLE $1 DOWN AND $1 A MONTH, THE CINCINNATI COMPANY WILL HAVE A LOCAL CONTRACTOR INSTALL THE THREE RECEPTACLES SHOWN, EQUIPPED COMPLETE WITH LAMPS, IRON AND IRONING BOARD

Upon payment of $1, the company offers to send to the customer's house a recognized electrical contractor who will install a drop-lamp and an outlet for an electric iron in the kitchen, and a drop-lamp in the basement—all as shown in the accompanying sketch. In addition to this wiring, which is installed concealed in approved fashion, the Union company furnishes the customer with two 60-watt lamps, a 6-lb. electric iron, an ironing board, and a free inspection certificate (cost $1). These items, according to the company's literature, total in value $32.22, representing, therefore, a saving of $13.22 to the customer, who pays his $19 in as many monthly installments of $1 with each electric-lighting bill.

TABLE OF UNIT COSTS FOR WIRING OLD HOUSES AT CINCINNATI

No. of Outlets	Class A Single Flooring	No. of Outlets	Class A Single Flooring	No. of Outlets	Class A Single Flooring
5	$15.85	24	$45.45	43	$73.25
6	17.85	25	46.85	44	74.89
7	19.85	26	48.25	45	76.53
8	21.85	27	49.65	46	78.17
9	23.85	28	51.05	47	79.81
10	25.85	29	52.45	48	81.45
11	27.25	30	53.85	49	83.09
12	28.65	31	55.25	50	84.73
13	30.05	32	56.65	51	86.37
14	31.45	33	58.05	52	88.01
15	32.85	34	59.45	53	89.65
16	34 25	35	60.85	54	91.29
17	35.65	36	62.25	55	92.93
18	37.05	37	63.65	56	94.57
19	38.45	38	65.05	57	96.21
20	39.85	39	66.69	58	97.85
21	41.25	40	68.33	59	99.49
22	42.65	41	69.97	60	101.13
23	44.05	42	71.61		

CLASS B—MIXED FLOORING

Prices as per Class A, except as below:

Located under double flooring, second or third-story ceiling outlet	$1.00 extra
Switch outlet (controlling any center outlet)	1.00 extra
Located under hardwood flooring, second or third-story ceiling outlet	3.00 extra
One switch outlet (controlling any center outlet)	3.00 extra
Additional switch outlets on same gang (controlling same center outlet), each	1.50 extra

HARDWARE

Push-button switches, each	$1.25
Push-button three-way switches, per set of two switches	3.50
Push-button four-way switch	2.45
Three-way snap switches, per pair	1.95
Porcelain-base switches, each	0.30
Porcelain-base Edison receptacles, each	0.30
Bryant flush-plate receptacles	0 80
Chapman flush-plate receptacles, each	1.15
Drop-cord key socket, each	0.35
Drop-cord chain socket, each	0.50
Floor receptacles	3.25

For wiring old houses having a large number of outlets the company has, with the co-operation of local contractors, formulated a unit schedule of wiring costs as reproduced herewith. Under the agreement signed by the customer, an initial payment is made of not less than 25 per cent of the entire cost, and the balance is paid in monthly installments as may be agreed upon.

Load Limiters and Flat-Rate Service for Miners at Youngstown, Ohio

To make it profitable to supply service to the humble homes of miners in its community the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, has adopted the practice of installing flat-rate load limiters in such homes and charging in advance at the rate of $1.25 per four 25-watt lamps per month. Prompt payment is encouraged by allowing a 25-cent discount. Unnecessary burning of lamps is minimized by making the miners purchase their own tungsten lamps and instructing them that long-hour burning will require buying more lamps each year.

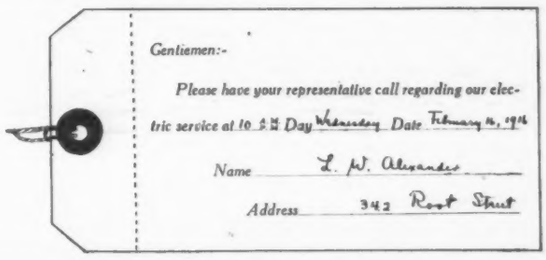
The load limiters used are a development of the Youngstown company and cost about $2.16 apiece. Some trouble was experienced at first from customers meddling with the limiters and trying to prevent their interrupting the circuit when more than the contracted-for load was connected. This trouble was partly alleviated by prosecuting some of the offenders, but repetition had to be prevented by inclosing the limiters in cut-out boxes the covers of which are sealed.

Application blanks for this flat-rate service are headed "Electric service for miners' cottages," in order to discourage other classes of customers, whose development as users of electricity might be handicapped by load limiters, from contracting for flat-rate service instead of metered energy.

In developing its business in the miners' districts the company has found that a 1500-watt connected load can be served from a 1-kw. transformer, owing to diversity in individual demands. Therefore, assuming that every consumer pays promptly and receives 25 cents discount, $15 per month is obtainable per transformer-kilowatt.

A Post-Card Help to Facilitate Re-connections of Rental Property

When the tenant of a rented dwelling at Pittsfield, Mass., moves away and discontinues electric service, the man sent to the premises by the Pittsfield Electric Company to disconnect the meter carries with him several of the post-card tags reproduced herewith, and before leaving the vacant house ties one of these tags onto the lighting fixture in the front hall. Here it


Gentlemen:-
Please have your representative call regarding our electric service at to 2 P.M. Day Wednesday Date February 16, 1916
Name L. W. Alexander
Address 342 Root Street

THIS POST-CARD TAG, ATTACHED TO THE HALL FIXTURE, AWAITS THE NEW TENANT'S INSTRUCTIONS FOR CONNECTING UP ELECTRIC SERVICE

cannot fail to be noticed by the succeeding tenant, who has only to tear it along the perforated line, fill in his name and address and the time that service is desired, affix a stamp, and drop the card into the nearest mail box, the post card being already addressed to the company's office. Last year in Pittsfield the central-station company had nearly 800 re-connections, according to H. W. Derry, contract agent, and the provision of these post-card helps has made it easier for intending customers to do business with the company.

Prices for Wiring Old Houses at Milwaukee

Prices for wiring already-built houses at Milwaukee, Wis., as agreed to by the Milwaukee Electric Railway & Light Company and the contractors co-operating with the company, are based partly on the type of floors above the rooms to be wired. If the floors above are of soft wood, the price per outlet is $2.31, and if hard-wood floors are to be encountered the charge is $2.47 per outlet. Outlets for electric ranges are installed for $15 each. All wiring contracts secured by the electric company's agents are turned over to the contractors with the understanding that the central-station company will pay the contractors for the work at completion and will then collect from its customers on a deferred-payment plan.

At first some of the contractors were rather reticent when the co-operative plan was explained to them. A few, however, immediately professed belief in the success of such a co-operative undertaking. Finally the electric company set a limiting date, after which contractors who had not agreed to accept the plan automatically signified their intention not to do so. After that date the work was parceled out among those co-operating as fast as it was contracted for.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

How a Commutator Was Repaired Under Difficulties

Nature of Trouble Encountered—How It Was Remedied and the Commutator Finally Turned by a Special Adjustment of Turning Rig

By A. Hervey

The commutator of the machine shown in the accompanying halftone illustration has on a number of occasions given trouble because of the mica breaking down between the segments and at the end rings. A short time ago the ground lamps started flickering while this machine was in service. After a member of the engine-room crew had failed to relieve the trouble, an electrician was called in. Two segments were located that had been hot enough to melt the solder out of the joint between the bars and the risers. This appeared to be the seat of the trouble.

Before the commutator was opened it was blown out with an air blast at the front and back to remove the copper and carbon dust and prevent it from falling into the commutator and giving trouble when the latter was opened. One of the bars that showed signs of being hot had welded to the rear-end ring, forming a

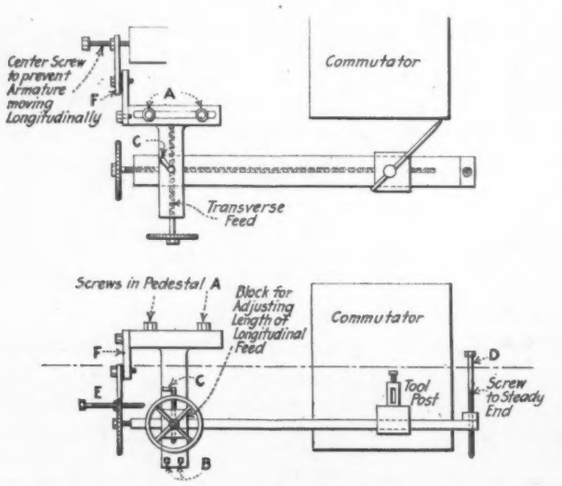


FIG. 1—METHOD OF ATTACHING TURNING RIG TO MACHINE, SHOWING ITS OPERATION WITH TOOL UPSIDE DOWN

ground. As this bar passed from one brush to the other the ground changed from the positive to the negative bar, causing the ground lamps to flicker. Considerable oil had crept along the shaft and found its way into the commutator, starting the trouble by causing the binder in the mica ring to disintegrate. Four segments were removed so that a patch could be put in the mica ring, as shown in Fig. 2. The old ring was measured for thickness, and two pieces of special ring mica were put in, with a thin piece of clear mica covering each of the four joints. A high-grade shellac was used to hold the pieces in place until the commutator was tightened and also to fill up the small openings in the mica and keep oil out.

The risers used on this machine were poorly attached to the commutator bars, being merely soldered in a shallow slot in the center of the bar. Before the heated segments could be replaced it was found to be necessary to scrape the thin coating of solder from the riser and out of the slot in order to make a good joint. If a current is passed through a soldered joint while the solder is hot enough to flow, the structure of the solder is so changed that the resistance of the joint is very much increased and will continue to give trouble if worked near its original carrying capacity, although to all appearance a good joint has been made.

FIG. 2—SECTION OF PATCHED END RING

When the commutator was built amber mica was used between the bars. About every two years it has been necessary to remove a few pieces, and these have been replaced by micanite, which is supposed to be able to withstand the bad effects of oil better than the former. At this time ten pieces of mica that showed signs of pitting were taken out. Two pieces were of the original amber and the rest were micanite, some of which had not been in service more than two years. This case does not, however, afford a fair comparison between the two grades of mica. If the leads had been poorly soldered into the riser or the riser into the bar, a high-resistance joint would have resulted, causing imperfect commutation with creepage of current across the mica between bars. This creepage will in time break down the mica segment and thus short-circuit the bars.

In order to test for a short-circuit, after the leads were soldered in and the commutator drawn tight the engine was started and the field switch closed. If a short-circuit had existed, it would have caused one

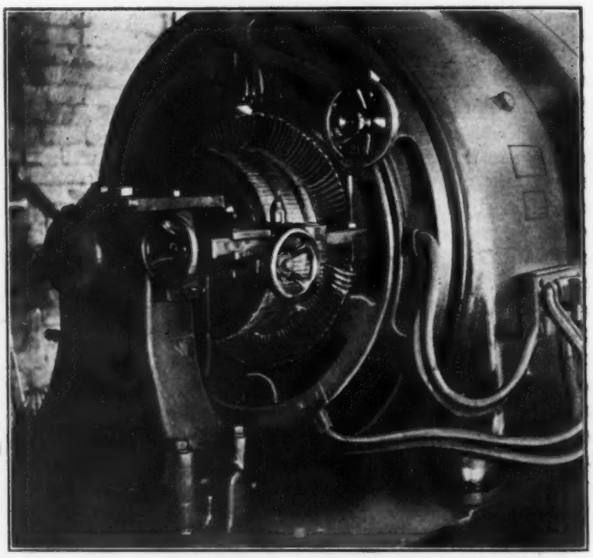


FIG. 3—RIG IN PLACE ON MACHINE FOR TURNING COMMUTATOR

or more coils to get hot in a few minutes, but none was present.

Since it had been necessary to turn this commutator so often the owners had purchased a turning rig which was supposed to fit this machine. The accompanying photograph was taken after one cut had been made. The common difficulty with turning devices is that they seldom fit a machine unless made specially for it. In this case if the rig had been put on the right side of the pedestal it would have been necessary to leave the bearing cap off or to have the tool considerably above the center. In the latter instance in case the tool caught it would have dug into the commutator. The only other way by which the rig could be attached was to put it on the side as shown, so as to cut with the tool upside down. Although the rig was not so steady as it would have been if worked in the correct position, no difficulty was encountered.

The turning rig used on this job was very easily attached. It was unnecessary to remove a single brush holder in order to put it in place. The two screws at *A* in Fig. 1 held the main part of the rig to the bearing cap. The two screws *B* are screwed against the side of the pedestal to steady the end of the rig. By loosening the screw *C* the transverse-feed length was readily adjusted. The end of the transverse-feed arm was supported by the long screw *D* resting on a brush-holder arm. To prevent any lateral motion of the armature the screw *E* was held in the center of the shaft by the adjustable arm *F*.

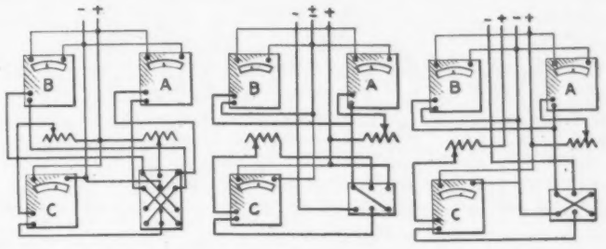
Method of Ascertaining Error in Indicating Instruments

BY PERRY A. BORDEN

In calibrating a wattmeter against an indicating standard instrument it is customary to hold one instrument, usually the meter under test, on a cardinal point and estimate on the other meter the amount of its departure from the same reading when equal power is passed through both instruments. If neither of the instruments is equipped with an interpolated scale, the small deviation from the cardinal point introduces into the reading a possible error which may be a very considerable percentage of the true error of the meter. Even with an interpolated scale the readings will usually lie on a point whose error, as compared with that of a primary standard, is not known. Trouble due to this scource is even more noticeable when using a Kelvin balance, where it is usual to set the balance on the desired point and make the necessary interpolations on the meter under test.

In the method described in what follows here both meters may be set on cardinal points and the error read on the dial of a third meter so connected as to show the difference in power necessary to hold the two meters at the same scale reading. In the accompanying diagrams *A* represents the standard, *B* the meter under test, and *C* a meter having a scale reading not less than the maximum error of *B*. With only one source of potential at hand it becomes necessary, in obtaining values where *B* may be either above or below the standard, to use a four-pole, double-throw switch connected as shown in Fig. 1. With the switch to the right $C = B - A$, while with the switch to the left $C = A - B$. With a three-wire system the connections become more simple. Only a two-pole, double-throw switch is necessary, as shown in Fig. 2, while with a separate source of potential or a phantom load to operate *C* the wiring required would be as indicated in the third diagram of the accompanying illustration.

The method of operation is as follows: Whichever meter is fed directly through the main load is held by that load to the cardinal point, while by means of the auxiliary load the other instrument is held to the corresponding point on its scale. The reading of *C* will



FIGS. 1, 2 AND 3—CONNECTIONS OF METERS IN WHICH C IS USED TO SHOW THE ERROR OF B

Meter *A* is a secondary standard and *B* the meter to be checked. The readings of these two meters are held on cardinal points and the interpolated error read on the third meter *C*.

then be the amount of power necessary to make up the difference between the two meters and thus indicate the error of *B*.

In case a low-reading wattmeter is not at hand, *C* may be constructed of almost any dynamometer-type indicating meter by bringing out the ends of its moving coil and using it for current, the field being produced by passing through the series coil approximately full load current of the meter. Thus *C* may be given a scale of from 5 watts to 10 watts, and the error of the instrument under test read with greater accuracy than is possible with the direct-comparison check under average conditions.

A method similar to the above can be used to advantage in many cases when checking the accuracy of voltmeters and ammeters.

Cost of Making Steam for Building Heat

Results of Comparative Coal Tests and Data Showing Cost of Generating Steam in Six Different Installations in New York City

Some comparative data on the cost of operating heating plants taken from the operating records of a number of installations in New York City were presented by George W. Martin in a paper before the American Society of Heating and Ventilating Engineers at its recent New York meeting. A summary of the results of tests made during the past summer on a 150-hp. return-tubular boiler using different grades of anthracite coal available in New York City is given in Table I. These results show the lowest cost for generating 1000 lb. of steam when using No. 3 buckwheat coal.

The boiler tested was in service for supplying steam for industrial purposes and during all the tests operated much under rating. The usual method of boiler testing was followed. The coal was weighed back each hour to obtain the hourly evaporation, the quality of steam was determined by calorimeter, and the flue gases were analyzed at frequent intervals, the latter process being of great assistance in determining the correct position of the flue damper. The feed water was measured by a Worthington piston-type water meter, the steam output being measured by a General Electric steam-flow meter, while a St. John meter measured the steam for operating the boiler-feed pump.

In the use of forced draft the author points out that the best results were obtained by keeping the draft balanced; that is, for any blower speed or air pressure in the ash pit the damper is opened just enough to carry the gases away from the furnace and through the boiler.

The use of such a system of controlled combustion is that air leakage into the boiler is largely eliminated, since the draft over the fire is much reduced and much less air is drawn in through the setting.

A comparison of the cost of steam generation in a number of plants is given in Table II. These figures were originally given by the author in a report of the station-operating committee of the National District Heating Association, but they have been partly revised and extended in two cases to include operation during the whole season. All the plants are largely for heating, hence the load is subject to the vagaries of the weather.

TABLE I—RESULTS OF COMPARATIVE COAL TESTS

	No. 3 Buck-wheat	No. 2 Buck-wheat	No. 1 Buck-wheat	Pea Coal	Soft and No. 3 Buck-wheat
Moisture in coal as received	6.9	8.0	4.8	3.4	8.3
Volatile per pound dry coal	7.9	9.3	7.2	7.1	12.6
Fixed carbon	76.9	75.3	75.9	74.2	75.4
Ash	15.4	15.4	16.9	18.7	12.0
B.t.u.	12,423	12,080	12,140	11,961	12,944
Length of tests, hours	24	24	24	24	24
Total dry coal consumed, lb.	4,800	5,514	5,171	5,531	4,400
Per cent ash and refuse	18.6	17.1	17.0	16.8	14.3
Total water fed to boiler, lb.	42,988	46,275	46,335	51,395	45,045
Factor of evaporation	1.08	1.074	1.077	1.083	1.076
Equivalent water from and at 212 deg.	46,427	49,699	49,903	55,712	48,468
Horsepower developed	56.1	60.0	60.3	67	58.5
Builders' rating	150	150	150	150	150
Per cent of builders' rating developed	37.4	40	40	44.8	39
Efficiency of boiler and grate	75.6	72.3	77.1	84.8	82.5
Cost of coal per net ton	$2.22	$3.15	$3.65	$4.40	$3.15
Fuel cost of 1000 lb. steam, cents	13.25	20.4	21.4	23.5	16.8
Fuel cost from and at 212 deg.	12.26	19.0	19.8	21.7	15.6

The low evaporation in some of the cases is due to the extremely variable loads of the fall and spring with the attendant standby losses. For plants that are operated only a part of the year it is impossible to maintain an efficient labor force and hence the economy suffers. However, a high cost of 1000 lb. of steam generated does not always mean a high total cost for the season, for the total steam generated may be low owing to proper attention to the actual demands of the building, and hence the total cost for the season is kept at a low figure.

In several instances where the results cover a short period the apparatus for weighing coal and water had but recently been installed. Such tests do not represent the performance throughout the year, but do convey an idea of the possible economy. In all the plants No. 3 buckwheat coal, delivered at $2.50 a ton, was burned with a balanced draft. Building No. 1 is a twenty-five-story office structure, covering a plot of about 9000 sq. ft. The boiler plant consists of two Heine water-tube boilers operated at 70 lb. pressure and supplying steam for cooking, heating and hot-water service. The plant is shut down during the summer and the steam for cooking purchased. No. 2 is a large twelve-story loft building containing about 4,000,000 cu. ft. Steam is used for manufacturing in large amounts throughout the year twenty-four hours a day. The boiler plant is made up of three fire-tube units. No. 3 is a new office building twenty-five stories high, with a volume of about 6,500,000 cu. ft. The equipment for heating and hot-water service consists of two Erie City water-tube boilers, operated at 30 lb. pressure. The boiler-feed vacuum and sump pumps are operated by electric motors. The boilers are shut down during the non-heating season, and hot water is supplied by a small heater. No. 4 is a loft building in the old commercial section of New York. This building has only recently had supervisory service. The figures show extravagance in the labor costs and the use of forced draft in burning the coal. This case illustrates the too frequent condition where continuity of service is the only consideration given the power plant. No. 5 is a large department store of about 15,000,000 cu. ft. contents. Four B. & W. water-tube boilers supply steam for cooking, refrigeration, operation of a cash-tube system, hot water and heating. No. 6 receives steam from a boiler plant 750 ft. distant. The plant is operated (only when heating is required) by three B. & W. units at 100 lb. pressure. The boiler-feed water comes from a heater at a temperature well over 200 deg. Fahr. The load conditions

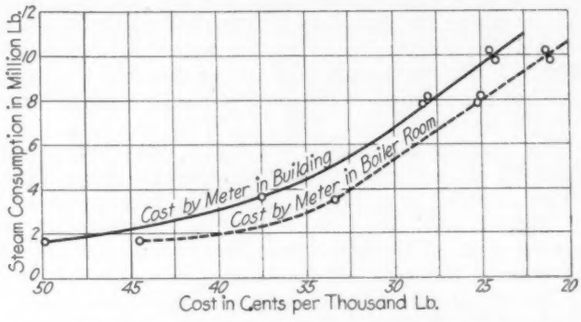


FIG. 1—STEAM-GENERATING COSTS FOR BUILDING NO. 6 OF TABLE II.

and the general design for this plant permit fairly satisfactory operation, as may be seen from the costs.

In Fig. 1 the costs of steam generation for building No. 6 for various amounts of steam generated are given. The customer is billed on the basis of readings of a meter in the building. The full line in Fig. 1 shows the costs based on those meter readings, while the broken line shows the costs based on meter readings in the boiler plant. The difference represents the loss due to condensation in the line.

In most of the cases discussed the boiler grates were originally installed for burning No. 1 buckwheat with natural draft. The change in the setting for burning No. 3 buckwheat involved the building of a hollow bridge

TABLE II—COMPARISON OF COST OF GENERATING STEAM IN SIX PLANTS

	Number of Building					
	1	2	3	4	5	6
Number of days	15	365	5	4	46	227
Steam generated, 1000 lb.	1,611	29,039	485	124	10,310	47,401
Tons of coal, gross	117	1,782	30.3	11.3	783	3,337
Rate of evaporation	6.15	7.3	7.13	4.94	5.89	6.34
Average outside temperature	30.7		39.6	37.0	34.8	40.9
Cost per 1000 lb. of steam:						
Coal	$0.191	$0.163	$0.165	$0.238	$0.203	$0.193
Labor	0.049	0.093	0.079	0.251	0.052	0.063
Ash removal	0.010	0.009	0.009	0.021	0.008	0.008
Make-up water	....	0.005	....	....	0.007	0.001
Electric current, blower	0.014	0.005	0.007	0.021	0.008	0.006
Electric current, feed pump	....	....	0.007	....	....	....
Supplies	0.004	0.011	0.006	0.002	0.004	0.006
Repairs and miscellaneous	0.004	0.004	0.002	0.001	0.003	0.002
Total	$0.272	$0.290	$0.275	$0.534	$0.285	$0.279
Fixed charge on investment	0.029	0.054	0.054	0.084	0.044	0.033
Total cost per 1000 lb.	$0.301	$0.344	$0.329	$0.618	$0.329	$0.312

wall with a cast-iron air box and damper set in the front of the wall at the back of the ash pit. A motor-driven blower was set outside the boiler at one end of the bridge wall, a hand-controlled rheostat being used to vary the speed of the blower-motor. The grates installed were of the dumping type and contain about 10 per cent of air space. The cost of the installation of grates, motor-driven blower, rheostat and rebuilding the bridge wall averaged $3 per boiler horsepower. No. 3

buckwheat coal, bought in wholesale quantities, costs, delivered in the bunker, between $2.35 and $2.50 a net ton. The coal is from the Scranton district of the Pennsylvania anthracite region and runs from 12,300 to 12,900 B.t.u. and from 16 to 13 per cent of ash. A poor grade of No. 3 buckwheat, it is stated, has no advantage over a better grade of No. 1 or No. 2 buckwheat, so that unless a good quality of coal can be assured it is useless to attempt economies by burning the smallest size of anthracite, even when it is mixed with soft coal.

A Temperature Rule of Thumb

BY A. S. SUTCLIFFE

The writer agrees with E. C. Parham's contention, in the article on page 216 of the Jan. 22, 1916, issue, that it is a poor rule which does not work both ways. In checking over the problem as presented by Mr. Parham, however, it has been found that an incorrect assumption has been made in calculating the cold resistance. For instance, with a room temperature at the start of 20 deg. C., a measured hot resistance of 116 ohms, a final corrected temperature rise of 40 deg. C., and applying the rule that the resistance of copper increases 1 per cent for each 2½ deg. C. of temperature increase, then $40 \div 2.5 =$ number times 1 per cent of resistance $= 16$. If one considers the original cold resistance as 100 per cent, then the hot resistance is 116 per cent of this cold resistance value, and since the hot resistance is 116 ohms, then the cold resistance is $116 \div 1.16 = 100$ ohms.

This seems to clear up the objection to the rule as given by Mr. Parham. It is important to bear in mind when applying the rule to cold resistance that the hot resistance is more than 100 per cent of the cold value.

A Method of Protecting Linemen When Working on a Transmission Network

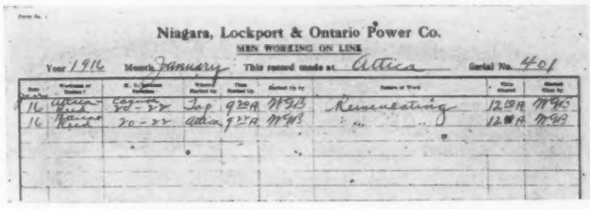
WAYNE G. BROOKINS

A great many methods are in use by transmission companies to prevent the energizing of circuits while linemen are making repairs on them. The practice of attaching a tag on oil switches and similar apparatus connected to the line being worked on and filing this as a work record, which has been in use by certain systems, is entirely inadequate, both from a protective standpoint and as a record. A better method which has been devised and successfully used for some time on the system of the Niagara, Lockport & Ontario Power Company is described in what follows. The scheme calls for the numbering or designating by a symbol of every switch on the entire system.

When any particular circuit must be repaired, the foreman calls the central-station operator and states that he is prepared to work, for instance, on the "Cayuga" feeder, between switches No. 20 and No. 22. The central-station operator immediately transfers any customers that may be securing energy from this circuit to another or parallel feeder, and opens the oil switch, making the feeder "dead." He then continues to clear up the circuit by opening the air disconnecting switch—no lineman being allowed to work on a circuit with oil-switch protection only—which we will assume in this case to be switch No. 20. The operator will then call the outlying switching station and request the attendant at that point to open air disconnecting switch No. 22.

After the attendant at the "tap" has opened switch No. 22, he calls the central-station operator and reports the switch open. The central-station operator, who has a line diagram at his desk with various plugs to designate the different switches, will then pull the plug from the board, denoting that the switch is open. Next, the attendant will be requested to fill out a record sheet such as that shown in the accompanying illustration. In this case he will enter "Attica" (station name) and "Reed" (line foreman) on the Cayuga circuit, between switches No. 20 and No. 22 at 9.20 a. m. The central-station operator will also enter in the space provided a description of the line work about to be performed. Next, the operator will get in touch with the line foreman over the telephone and address him as follows: "The Cayuga circuit is dead between switches No. 20 and No. 22, and I have you 'marked up' on the Cayuga circuit between switches No. 20 and No. 22 at the 'tap,' and I will mark you up on the same circuit at Attica at 9.22 a. m." The line foreman repeats each word, in order that the conversation may not be misconstrued.

When the repair job is completed, the line foreman will call the central station and get marked clear of the


Niagara, Lockport & Ontario Power Co.
MEN WORKING ON LINE
Year 1916 Month January This record made at Attica Serial No. 401

Date	Workmen or Gangs	C. O. Switches Switches	Ground Marked Up	Time Marked Up	Marked Up by	Nature of Work	Time Cleared	Marked Clear by
16	Attica Reed	Cay-20-22	Tap	9.22A	M.W.S.	Reinsulating	12.15A	M.W.S.
16	Kenyon Reed	20-22	Attica	9.22A	M.W.S.	" "	12.15A	M.W.S.

RECORD THAT IS USED TO CHECK UP WORK ON LINES AND PROTECT LINEMEN

line. No operator is allowed to clear this line except the man actually marked up. If the party first marked up desires to leave before the work is completed, he will call the operator and get marked clear, and the man who will be left in charge of the work will in turn be marked up in his place. The time the circuit is cleared will be filled in on the "Men Working on Line" sheet in red ink, followed by the initials of the operators who cleared the circuit. The station operator will then call the attendant at switch No. 22 and mark clear at that point. A "mark-up" must be made at any point where a set of switches could be closed to energize the circuit from a parallel source. After marking clear at this point the station operator orders switch No. 22 closed, and in the meantime the operator or his assistant at the central station closes switch No. 20. When both sets of air switches are closed oil switch No. 20A is closed, making the circuit alive and completing the repair operations.

The Heat Loss from Underground Steam Mains Measured by Melted Snow

BY T. W. REYNOLDS

The loss of heat units from underground steam mains and the precautions that should be taken to save this energy by the selection of suitable pipe coverings is a subject which is not ordinarily given much thought by the operating engineer. The uncovered ground which is often noticed over these mains in winter time, while a considerable depth of snow may lie on all sides, is a good index to this loss of heat.

Just what this loss in heat units may be is shown by the following calculations, based on observations that were made by Prof. R. C. Carpenter of Cornell University at Ithaca, N. Y., in regard to the melting of snow over an underground steam main 1000 ft. long with a pine-wood covering. The heat units lost from

this main were more than sufficient to melt quickly all snow as it fell for a distance horizontally of 1.5 ft. each side of the main, thus forming a pathway 3 ft. wide and 1000 ft. long through the snow. The temperature of the air and snow and the depth of the snowfall as given in this example are the averages for twenty-one years for the month of February.

The average snowfall was 14.04 in. Average temperature of the air and snow was 25.2 deg. Fahr. Path of melted snow was 3 ft. wide and 1000 ft. long.

$3 \times (14.04 \div 12) \times 1000 = 3510$ cu. ft. of snow melted.

Considering 0.125 as the specific density of snow, 0.505 as the specific heat of snow, and 62.45 lb. as the weight of 1 cu. ft. of water, then

$$3510 \times 0.125 \times 62.45 = 27{,}400 \text{ lb. water,}$$

and 32 — 25.2 (average temperature) = 6.8 deg. Fahr., temperature rise..

$$6.8 \times 0.505 \times 27{,}400 = 94{,}092 \text{ B.t.u.}$$

required to raise the temperature of the snow from a temperature of 25.2 deg. Fahr. to 32 deg. Fahr., its temperature at the melting point.

Considering 80 B.t.u. as the latent heat of snow, then,

$$27{,}400 \times 80 = 2{,}192{,}000 \text{ B.t.u.}$$

required to melt snow at 32 deg. Fahr. into water at 32 deg. Fahr.

The total loss is

2,192,000 B.t.u. + 94,092 B.t.u. = 2,286,092 B.t.u.

Allowing 13,000 B.t.u. to 1 lb. coal and disregarding boiler efficiency, this loss corresponds to

$$2{,}286{,}092 \div 13{,}000 = 176 \text{ lb. coal.}$$

This represents the coal consumption necessary to melt the snow over the 1000-ft. steam main mentioned and is a measure of the heat lost continually on the basis that all the heat in the coal is available. Under the best of conditions not more than 65 per cent of the heat in the coal can, however, be utilized.

The additional heat units required to raise the temperature of the water from the melted snow to the temperature of the ground immediately above the main, and to evaporate this water, are not included in these figures. The heat loss in any case will naturally vary with the difference between the temperature of the steam in the main and the temperature of the air or snow.

The Value of Inflicting Pain by a Blow in Resuscitation After Electrical Shock

By W. P. Strickland

General Inspector New York & Queens Electric Light & Power Company

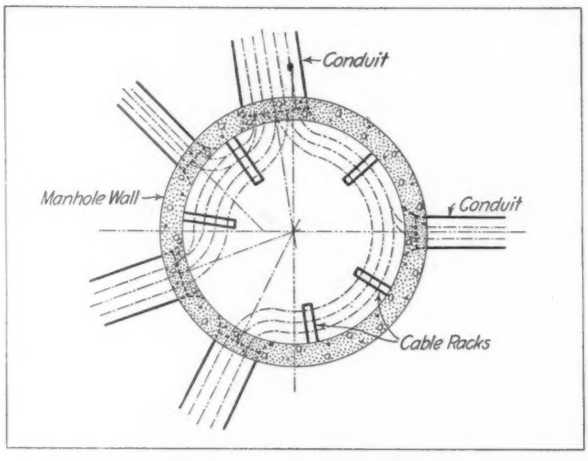
Recently one of our foremen after climbing a pole preparatory to stringing primary wires received a shock that caused him to fall to the ground. It is inferred that in adjusting his belt and shifting his position his spur cut out, and that to save himself he instinctively reached out and touched the wires carrying 2300 volts. When the other linemen and ground hands reached him to all appearances the man was dead. One of the linemen, following instructions, immediately took hold of the ankles of the limp body, lifting it until the whole weight rested on the neck and then letting it fall. He then took a pair of connectors and hammered the soles of the injured man's feet without removing his shoes. Another lineman opened the man's mouth, pulled forward the swallowed tongue (which occurs in electric shock) and was about to begin the Schaefer prone method of resuscitation when the man returned to life. He was removed to the hospital and is alive and well to-day, though suffering severely from his burns.

For the past year the writer has been teaching his men to strike the feet without removing the shoes in all cases of electric shock. Some years ago an accident occurred where a man came in contact with 6600 volts, fell from the pole and was restored to consciousness by this means, although he was terribly burned and died three days later. Another accident that came to the writer's attention happened in New Jersey when a man came in contact with a wire carrying 2200 volts. This man was struck violently on the feet, his tongue was pulled out, and he was restored to consciousness before the arrival of the doctor.

Advantages of a Circular Manhole in Industrial-Plant Systems

By D. W. Blakeslee

In designing industrial-plant distribution systems the writer has been able to save many hundreds of dollars on underground equipment by the use of circular manholes with radiating conduits as indicated in the accompanying diagram. The saving has been due to a reduction of the number of manholes required and the shortening of the conduits, resulting in a decrease in the length of cables for the transmission of alternating and direct current for motors and illumination. As many as sixty-four duct lines have been passed through this type of manhole, about half of which were three-conductor cables, the remainder being single and twin cables.



A CONSTRUCTION DESIGNED TO REDUCE NUMBER OF MANHOLES REQUIRED AND SHORTEN CONDUIT RUNS

The shape of the manhole permits of the use of the minimum amount of material for its construction with the maximum inclosure. When the material is concrete, another saving results because of the relative ease with which the temporary forms may be constructed.

The plants in which this type of construction has been applied are by-product coke oven and benzol plants. Although the ovens, buildings, tanks and the like are usually laid out so as to leave rectangular open spaces between them to a certain extent, by securing full information regarding all foundations and by co-operating with the engineers in charge of steam, water, gas, sewer and other underground systems it has been found that the use of the circular manhole with its radiating conduits results in a saving over the usual type of manhole because of the relatively larger number of the latter required when they are situated in the open spaces or streets so as to permit the conduits to turn and branch at right angles.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

"The Average Eye" in Color Photometry

Results Obtained from a System of Heterochromatic Measurements—The Flicker Versus the Equality-of-Brightness Photometer

AS a solution of the problem of color photometry the use of the flicker photometer under specified conditions has been proposed, in particular by Dr. H. E. Ives. To strengthen the position of the flicker photometer there has been developed also a complete scheme for the choice of normal groups of observers, including the establishment of an "average eye." This proposed systematization of heterochromatic measurements appeared so definite and practicable as to deserve a thorough trial, and this trial has been made by the 1915 committee on research of the Illuminating Engineering Society. The results of this investigation are given in a paper presented by E. C. Crittenden and F. K. Richtmyer at the recent meeting of the Illuminating Engineering Society. The experimental research was carried out in the laboratories of the Bureau of Standards.

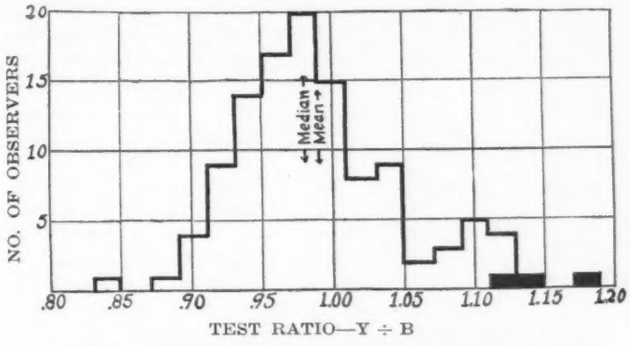


FIG. 1—CHART SHOWING RESULTS OF OBSERVATIONS

The authors' work was planned to show the difference to be expected between individuals and to include readings by a large number of observers so as to establish average or normal values for various measurements involving color differences. In general similar measurements were to be made on a flicker photometer and on an equality-of-brightness photometer in order to establish the relation between results obtained by the two methods and the relative certainty of measurements made by the two types of instruments.

The research shows that for accurate heterochromatic measurements a systematic choice of observers is essential. Fig. 1 illustrates the distribution of 114 observers with respect to the characteristic ratio $Y \div B$, i.e., the ratio of transmission of yellow test solution to that of the blue solution (these being the Ives-Kingsbury test solutions). The proposed normal ratio of transmission of these test solutions with a 4-watt-per-candle carbon lamp is 1.00. As Fig. 1 shows, the actual agreement with the assigned value of unity is very good. The ordinates represent the number of individuals falling within a range of 2 per cent; for example, between 0.890 and 0.909 inclusive there are four observers. The black rectangles represent "color-blind" observers. The arithmetical average of the 114 ratios is 0.990. If the three observers classed as color-blind are omitted, the average is 0.986, but actually the line between normal and abnormal color vision is very difficult to draw; moreover, the relation between color and luminosity is not very definite, and in making up an average luminosity scale there is little justification for ignoring that percentage of the people who are color-blind. On the other hand, taking an average may give undue weight to the abnormal observers, and there is some advantage in taking instead of the "mean" the "median" value; that is, a value such that there are equal numbers of observers above and below it. In this case the median for the 114 ratios is 0.980, and the effect of omitting the three extreme observers mentioned is only to make the median fall between 0.979 and 0.980.

The differences in observed values arising from individual peculiarities, of course, increase as the color difference increases. When comparisons are made directly with a 4-w.p.c. carbon lamp, a difference of 1 per cent in the characteristic ratios of observers should result in approximately the following differences in observed candle-power of a tungsten lamp at the various specific consumptions given:

Watts per Candle	Per Cent Cp. Difference
3.1	0.0
1.4	0.1
1.0	0.2
0.75	0.3
0.6	0.4

When plotted in terms of lumens per watt these data give nearly a straight line. Fig. 2 shows the per cent deviation from normal values as a function of the characteristic ratio for the several color differences indicated. Thus an observer whose characteristic ratio $Y \div B$ is 0.90, in measuring the candle-power of a 1.2-w.p.c. tungsten lamp against a 4-w.p.c. carbon lamp

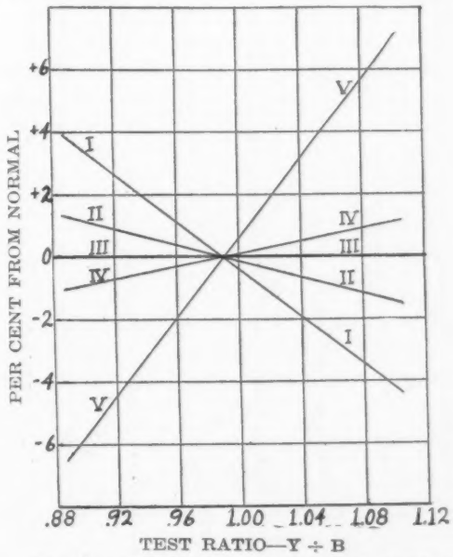


FIG. 2—DEVIATION FROM NORMAL VALUES

(3.1-w.p.c. tungsten), would assign to the tungsten lamp a value 1.2 per cent too high. To a 0.65-w.p.c. tungsten lamp he would assign a value 3.5 per cent too high. Of the 114 observers, 19 (17 per cent) would have obtained values for a 1.2-w.p.c. tungsten lamp differing 1 per cent or more from the normal value; 70 (61 per cent) would have departed 1 per cent or more from the normal in measuring a 0.65-w.p.c. tungsten lamp. Hence the important result is that for measurements on color differences of this type it is not necessary to have a group of observers whose average ratio is normal. Any observers may be used and their results corrected to the normal by use of curves similar to Fig. 2.

As to the comparative merits of the flicker and the equality-of-brightness photometers the authors reach the following conclusions: With regard to certainty of measurement the flicker photometer shows a decided advantage even with small color differences. With more experienced observers, specially selected, this advantage would probably be materially reduced, but would not be entirely lost, because even when an observer makes consistent settings on the equality photometer the relation of his settings to those of the normal observer is uncertain.

Trained observers are needed with either photometer, but with the flicker any observer of fair ability can make definite sets even with large color differences, whereas on the equality-of-brightness photometer it is only the exceptional observer who can do so.

There appears to be no doubt that for sources having relatively high intensity at the blue end of the spectrum the values given by the flicker photometer as used by the present authors depart appreciably from those obtained with the equality-of-brightness photometer as used in common practice, the difference probably being of the order of 3 per cent at the higher efficiencies reached by the present gas-filled lamps. It is, however, hardly proper to assume that the results obtained by either photometer are "right" and anything different is "wrong." The equality-of-brightness method of measurement is undoubtedly more closely related to the way in which the light is used, but it is by no means established that that method correctly indicates the relative usefulness of two kinds of light. It must be recognized that there is no one definite "correct" ratio between the intensities of two lights of different color. The relative candle-powers assigned to a carbon and a tungsten lamp, for example, depend to some extent on the conditions under which the measurements are made. The specification of conditions of measurement must be more or less arbitrary, and the results obtained cannot be expected to be an exact indication of the value of different kinds of light under different conditions. Before we shall know much about the relative usefulness of different kinds of light, much more experimental work must be done. An important requisite for such investigations or any other involving the comparison of the intensity of lights of very different color is a method which will enable different experimenters to make consistent measurements of the quantity which must serve as a basis for the comparison of their results. The usual equality-of-brightness method of comparison certainly does not fulfill this requirement; the flicker photometer at present is the most promising method available.

Generators, Motors and Transformers

Electric Rectifiers with Oxide Cathodes.—An abstract of a paper read by Professor Wehnelt before the German Physical Society in Berlin. The author had proposed eleven years ago rectifiers with an oxide cathode, but only recently have these found practical use. In an ordinary discharge tube the principal part of the potential drop is at the cathode. But in a tube containing incandescent calcium oxide as cathode and a steel pin as anode the whole drop is at the anode and depends on the metal and the gas which forms an atmosphere. In the larger rectifier tubes mercury vapor is used, in smaller ones argon. In former constructions a platinum sheet had been used as cathode covered with a layer of calcium oxide, but this layer disappeared after a few hours of burning. Donath has devised a method by which the cathode is continuously covered anew with calcium oxide. He does not use a platinum sheet, but an iridium ribbon wound in form of a spiral, and within the spiral he places a pin of calcium oxide, which evaporates and is deposited on the colder portions of the iridium ribbon. In this way the calcium oxide electrode may last a thousand hours of operation. The author exhibited various types of rectifiers of this kind. The type of 10 amp. and 120 volts has an efficiency of 60 per cent (this includes the loss in the transformer). The advantage of this type of rectifier over revolving converters is smaller weight and smaller price per capacity. In the discussion Orlich pointed out that the use of an oxide cathode represented the chief difference from mercury-vapor rectifiers; it needs no special starting device and the apparatus is easily transportable.—*Elek. Anzeiger*, Jan. 2, 1916.

Generation, Transmission and Distribution

Cost of Generating Electric Power.—B. SOSCHINSKI.—If the power plant's cost of generating the electrical energy during a year is written as the sum of the fixed charges and the product of the total number of kilowatt-hours and running charges per kilowatt-hour, it is important to define exactly what shall be comprised in the fixed charges and what in the running charges. Four systems used in practice are critically discussed by the author, and a fifth system is proposed by him and is more accurate. Numerical examples from several plants in practice are added.—*Elek. Zeit.*, Dec. 2 and 9, 1915.

Installations, Systems and Appliances

Electricity in Agriculture.—PAUL LEVY-SALVADOR.—A long article on the desirability and necessity of developing the uses of electricity in agriculture. He recommends co-operative associations of farmers for this purpose. A great many applications of electric motors as a substitute for manual labor are suggested. A review is given of French transmission and distribution systems which have already done some work in this line, together with a map of the cities and towns supplied by the network of the Sud Electrique Company. Figures are given to show that the proper application of electric power in agriculture permits a real financial saving in operation.—*La Revue Elec.*, Nov. 5, 1915.

Electric Elevators.—H. MARRYAT.—An abstract of a paper read before the (British) Association of Supervising Electricians. The author classifies the different types of elevators and then compares electric with hydraulic elevators as to first cost, running cost and maintenance cost. The first cost is very much the same. A completely automatic electric elevator may cost a little more than an ordinary hydraulic elevator, but no attendant is required with the automatic elevator, while one is needed in the other case. In the running costs the electric elevator, properly constructed, costs less all the time. With a hydraulic elevator the quantity of water used is the same whether the car be fully loaded or quite empty, but an electric elevator will carry its average load at practically no cost. With regard to the important item of maintenance cost, the balance is again in favor of the electric elevator.—London *Electrician*, Dec. 24, 1915.

Units, Measurements and Instruments

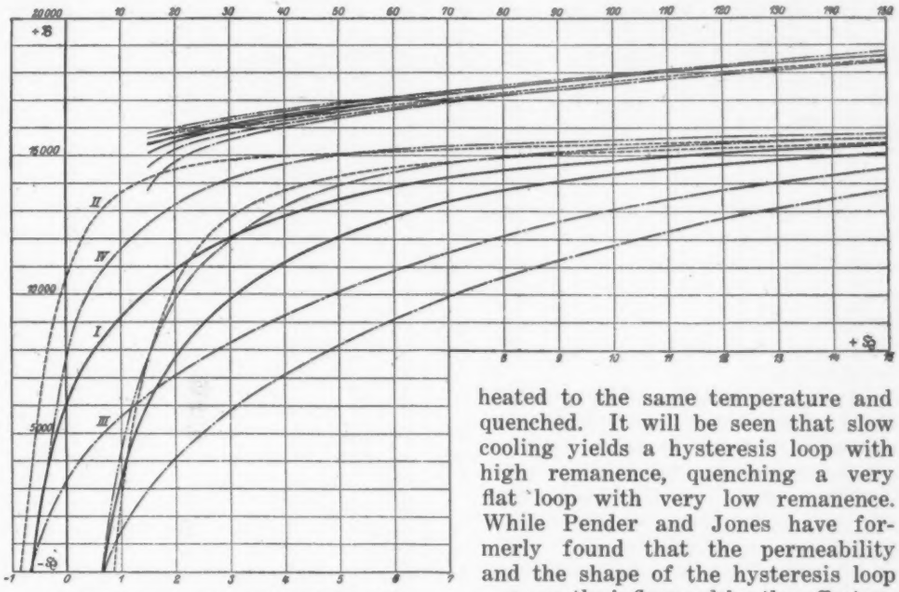
Double Dynamometer Wattmeter.—C. V. DRYSDALE.—The author refers to the fact that dynamometer wattmeters have met with a great deal of distrust and suspicion, but emphasizes that this is all unjustified. He considers the dynamometer form of wattmeter as being the only one which combines high accuracy with robust construction and moderate portability. A simple theory of the instrument is given. In order to be accurate it is necessary to fulfill the following conditions: The shunt resistance should be at least 3000 ohms per millihenry of inductance. The added resistance should have negligible capacity. Eddy currents should be avoided by keeping all metal out of the field. The current coils should be subdivided to avoid eddies, thus permitting them to be grouped in series or parallel for alteration of current range. The connections of a double dynamometer for measuring the power in a three-phase system are described and a recent design of such an instrument is illustrated and discussed. The article is to be continued.—London *Electrician*, Jan. 14, 1916.

Best Primary Capacity for Tesla Coils.—It has generally been assumed that to produce a maximum voltage on the secondary terminals the resonance relation $L_1C_1 = L_2C_2$, as proposed by Drude, was sufficient, these symbols referring to the inductance and capacity of the primary and secondary respectively. Recently, however, Taylor Jones has shown that the above condition does not apply if the primary capacity alone is varied. If the coupling coefficient has the value $k^2 = 0.36$, favored by Drude, the best capacity is at least twice as great as the resonance value. W. Morris Jones, in a communication to the *Philosophical Magazine*, has experimentally tested these results. With $k^2 = 0.348$, this value nearly agreeing with that which Drude recommends, he found that the maximum was obtained with a ratio of 3.3 $L_1C_1 = L_2C_2$, and the primary capacity was much greater than for the resonance value given by the expression first referred to above. He also found that the experimental curve differed considerably from the theoretical curve.—London *Electrician*, Jan. 21, 1916.

Recording Rapidly Changing Phenomena.—G. KEINATH.—A long illustrated article on the principles of recorders for rapidly changing phenomena. The author discusses the period of free oscillations and the power consumption of recording instruments and outlines the theoretical requirements of exact recorders. Errors with respect to phase and amplitude depend not only on the period of free oscillations of the oscillating system, but also in a high degree on its damping condition. The author describes the construction of the oscillograph, electrocardiograph (based on the Einthoven string galvanometer), and of spark recorders, and deals with the applications of the different recorders.—*Elek. Zeit.*, Dec. 2, 9, 16 and 23, 1915.

Electrophysics and Magnetism

Effect of Cooling on Magnetic Properties of Iron and Steel.—E. GUMLICH AND W. STEINHAUS.—An account of an investigation carried out in the German Reichsanstalt. If pure electrolytic iron is heated and then cooled at different rates of cooling, the magnetic properties can be very largely influenced by the rate of cooling. This is clearly shown by the curves below, representing hysteresis loops of electrolytic iron of exactly the same composition in all cases. Loop I refers to the iron before being subjected to heat treatment, loop II to the same iron heated to 900 deg. C. and slowly cooled, loop IV to the same iron heated to the same temperature and more quickly cooled, and loop III to the same iron heated to the same temperature and quenched. It will be seen that slow cooling yields a hysteresis loop with high remanence, quenching a very flat loop with very low remanence. While Pender and Jones have formerly found that the permeability and the shape of the hysteresis loop are greatly influenced by the effect on an alternating magnetic field applied during the cooling, the present authors could not confirm this result. From their experiments they conclude that, for the samples which they used at least, the effect is entirely due to the rate of cooling. By continuous heat treatment of electrolytic iron they were finally able to produce a material which has a very low true remanence and a very low coercive force. Such material would be particularly suitable for measuring instruments, which heretofore have had to be built without iron on account of the remanence being a disturbing factor when ordinary iron has been used as a material.—*Elek. Zeit.*, Dec. 23 and 30, 1915.



ELECTROLYTIC-IRON HYSTERESIS LOOP

Miscellaneous

Silver-Palladium Alloy.—A note on a silver-palladium alloy for use in contact and spark devices to replace platinum, invented by Paul R. Heyl. This alloy consists of silver and palladium in varying proportions according to the conditions under which it is to be used. An alloy of silver with 2 per cent of palladium gives satisfactory results under many circumstances. When the contacts or spark points are exposed to sulphur compounds 5 per cent or more of palladium should be used. The alloy which gives the greatest resistance to spark erosion was that of 60 per cent palladium and 40 per cent silver. Palladium has a higher melting point and lower thermal conductivity than silver, consequently additions of palladium to silver raise the melting point and lower the thermal conductivity. It has been found that, on account of the high thermal conductivity of silver, the heat from the spark will be conducted away fast enough to prevent melting of the silver. In view of this fact silver-palladium alloys with very high percentages of silver can be used in a great many cases with entire success.—*Met. and Chem. Engineering*, Feb. 1, 1916.

E. R. DAVENPORT

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Edward R. Davenport, sales manager of the Narragansett Electric Lighting Company, Providence, R. I., has been re-elected a director of the Providence Chamber of Commerce for a further term of two years and has also been appointed chairman of the committee on rivers and harbors.

Walter R. Moulton, who has just been promoted to the position of superintendent of electric sales for the Consolidated Gas, Electric Light & Power Company of Baltimore, Md., has been in charge of the company's "House Electric" for several years past.

W. J. Miller has been appointed general electric-vehicle representative of the Public Service Electric Company of Newark, N. J., succeeding S. G. Thompson, who resigned to become special transportation engineer for the White Motor Vehicle Company, Cleveland, Ohio.

R. L. Wilson, formerly manager of the railway division of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been appointed assistant general superintendent and will look after trades apprentices, employment, working conditions and other matters of a similar nature. Mr. Wilson entered the employ of the company in 1893 as a student draftsman.

Pressley H. Bailey has been appointed commercial manager of the Harrisburg (Pa.) Light & Power Company, to succeed R. W. Kiple, formerly of Easton, Pa., who died soon after he assumed the position. Mr. Bailey is well known in electrical and gas engineering circles of the Middle West, having served nearly fourteen years with the Logans Gas & Coal Company of Columbus, Ohio, and the Louisville (Ky.) Gas & Electric Company.

Dr. M. I. Pupin was formally awarded the Hébert prize of the Académie des Sciences of the Institut de France at a dinner at the University Club, New York City, Feb. 17. The award was made for Dr. Pupin's "method of mathematical analysis of electrical circuits, which is to-day recognized as classical," and for his "discoveries and inventions in electrical resonance, the tuning of electrical circuits, and the loading of telephone lines." Dr. C. O. Mailloux and Gano Dunn officially notified Dr. Pupin of the honor conferred upon him in the presence of a number of distinguished guests, including Dr. E. E. Corthell, Dr. D. S. Jacobus, J. J. Carty, E. J. Nally, Dr. S. S. Wheeler, Dr. C. T. Hutchinson, U. N. Bethell, H. B. Thayer, H. G. Stott, F. J. Sprague, C. E. Scribner, W. V. King and Theodore N. Vail.

Robert M. Feustel, a member of the firm of Sloan, Huddle, Feustel & Freeman, consulting engineers, Madison, Wis., has been engaged to make a physical valuation of the Bay State Street Railway of Boston, Mass.

Harry Hartwell, who has been connected with the Pearson Engineering Corporation of New York for the last four years as assistant to the vice-president, has been appointed acting general manager of the Winnipeg Electric Railway Company, Winnipeg, Canada.

W. E. Playter, who was formerly superintendent of the Mayfield (Ky.) Water & Light Company, has resigned as chief engineer of the Collinsville works of the St. Louis Smelting & Refining Company, having been appointed superintendent of the Collinsville plant of the South Illinois Light & Power Company. Mr. Playter will take charge about March 1.

F. H. SCHEEL

Fred H. Scheel, the chairman of the committee on residence lighting of the newly organized Lighting Sales Bureau of the National Electric Light Association, is commercial manager for the Public Service Company of Northern Illinois at Streator, Ill., and is one of the original organizers of the Lighting Sales Bureau. The report of the committee which is now in preparation will describe various methods of securing residence business and present details and results of those most successful.

G. D. SHEPARDSON

Prof. George D. Shepardson, who has just completed a quarter century of service as the head of the electrical engineering department of the University of Minnesota, Minneapolis, was the guest of honor at a congratulatory dinner at the Hotel Radison Feb. 12, tendered by his friends, associates and former students in the Northwest. The banquet proved to be an interesting occasion, and in addition to reminiscent and congratulatory addresses by many graduates and former students of the electrical school, a large number of letters and telegrams were received from all parts of the country from graduates and from other engineering friends and colleagues of the guest of honor. The feature of the evening was a series of lantern slides showing the various graduating classes from the first, in 1891, to last year's class. Including the class of 1916, the graduates of the department now number 349, while at least 1500 other students have received electrical instruction in the Minnesota department during Professor Shepardson's twenty-five years of service.

T. Lee Miller, who for the last five years has been assistant to the president of the Toledo Railways & Light Company, Toledo, Ohio, in charge of purchases and car maintenance, has been appointed manager of the New York office of the Sangamo Electric Company, 50 Church Street.

Obituary

Charles G. Burke, a pioneer inventor in telegraphy, who died recently at his home in Brooklyn, at the age of eighty, was the first to introduce the use of automatic transmitters for submarine cable messages. He devised a system in which the messages were transmitted by dot impulses only, the record being read, however, in dots and dashes. This result was accomplished by reading the periods between the impulses instead of the impulses themselves; in this way a long space indicated a dash and a short space a dot. The Burke system overcame inductance difficulties arising from charging the cable on long or dash impulses, and thus facilitated the relaying of cable messages.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

American Concentric-Wiring Fixtures on the Market

In a recently issued folder the General Electric Company, Schenectady, N. Y., announces the readiness for market of nearly two dozen devices adapted to bare concentric wiring, including cut-outs, junction boxes, snap switches, sub-bases, key and keyless receptacles, pull receptacles, polarity caps, fused and fuseless rosettes, sockets, clamps, and two tools. The last-named consist of special pliers for cutting and stripping the wire and a bending tool for curving the material in making neat runs.

The list prices range from 1 cent for supporting clamps to $1.10 for a combined three-wire, two-circuit switch and plug cut-out. All these parts have a standard catalog number and are sold in standard packages of 100 each, with the exception of the clamps, which are sold in lots of 500 each.

BARE CONCENTRIC CONDUCTOR

The wire so far applied, taking the No. 14 size, is primarily an inner conductor surrounded by an insulating wall and jacketed over all with a closed metal sheath having at least as large a carrying capacity as the inner conductor. The finished wire measures 0.22 in. over all. The wire illustrated in the folder has a single-braided, rubber-insulated, solid conductor, National Electric Code standard.

The outer conductor is composed of tinned sheet copper, folded longitudinally around the wire with a full lap, giving uniform and double thickness. The tinned sheath is soldered where it laps, so that it forms a continuous water-tight and gas-tight jacket having a conductivity in excess of No. 12 B. & S.

Concentric-wiring devices listed in this folder have been developed for use on single circuits or 660-watt branch circuits in the wiring of existing buildings. The folder emphasizes the ease with which this wire can be installed without disturbing wall decorations, being run directly on the surface of the wall and covered with paint or paper.

FITTINGS AND JOINTS

The fittings are so arranged that joints can be well and quickly made by expert workmen, and they are so designed that the grounded sheath is continuous throughout the system. Because of the possibility of injuring the rubber insulation on the wire the use of solder is considered inadvisable. The outer sheath is necessarily grounded at the service switch. In view of the fact that this material will, in all probability, find its most general use in the smaller and more inexpensive homes, only the surface devices are shown in the folder. There are being developed flush switches and flush plug receptacles for use with this wire.

The concentric-wiring system can be installed at present only by special permit from the local insurance or municipal inspection bureaus.

Boring Machine for Electrical Construction Work

The chain-drive boring machine shown herewith is a handy, inexpensive device which should have an especial appeal

CHAIN-DRIVE BORING MACHINE

for central-station interests and electrical contractors. It is of sturdy construction, can be easily handled, and weighs only 16 lb. The machine can be operated in either position, as shown in the illustrations. Where it is employed for boring holes through joists or studding from the floor below, a steel extension rod telescoping into wrought-iron tubing allows the desired adjustment for ceiling 7 ft. to 8 ft. high. The outside bearing for the upper sprocket wheel keeps the bit at right angles to the chain and tubing. On new-construction work where floors are not laid, or in the wiring of old buildings where one or two boards have been removed, the operator can use the machine on top of the joist to even better advantage than from the floor below. When operated in this position a cross-bar with foot pedal is attached, thus supporting the machine on the joists and permitting the use of the foot for starting the bit. The outfit may be provided with 10/16-in. or 11/16-in. bit as desired. The boring machine is being made by the Bowlus Manufacturing Company, Springfield, Ohio.

Socket for Preventing Theft of Lamps

To fill the demand for a "Mogul-base" socket from which it is impossible for an unauthorized person to remove the lamp, Pass & Seymour, Inc., have developed the No. 597 "Shurlock" socket shown herewith. This socket is fitted with a double "Shurlock" device, as it is called, which holds the lamp base rigidly, it is claimed, without in any way distorting the base of the lamp; thus the lamp is kept straight. The ease with which the lamp may be locked or removed by the proper person is a feature, the manufacturer points out, in favor of the installation of this socket

LARGE-SIZED LOCKING SOCKET

wherever a high-efficiency unit is desired for permanent installation. It is not so much the loss of the lamp itself which is usually to be deprecated as it is the fact that the space to be illuminated will be left in darkness should the lamp be removed or stolen. Therefore the value of this device lies largely in its prevention of the removal or theft of lamps.

Electric Incubators, Brooders and Egg Testers

The advantages of electricity for hatching and brooding chickens and testing eggs are becoming better and better recognized, and the convenience and adaptability of electric devices over those operated by gasoline, gas,

FIG. 1—ELECTRIC INCUBATOR WITH CAPACITY OF SIXTY-FIVE EGGS

steam and kerosene easily place them in the front wherever electric service is available.

Among the advantages claimed for electric incubators are simplicity of operation, close control of both heat and moisture, perfect ventilation, absence of smoke, soot, fumes and odors, safety with respect to danger from fire, etc. The electric incubator has also proved itself of great convenience in towns where either the law or insurance regulations forbid the use of oil-lamp incubators in certain types of buildings.

In the accompanying illustrations are shown several views of incubators and hovers heated by carbon-filament lamps. The incubator shown in Fig. 1 is of metal construction, the outside casing being of heavily enameled sheet steel and the inside or egg chamber of heavy galvanized iron. The dead-air space between the two is insulated with a sanitary, fireproof material. Ventilation is controlled from the outside by a metal slide in the bottom of the incubator, by means of which the intake of air can be easily and correctly regulated. The moisture or humidifying tank is on a flange attached to the side of the egg chamber, sliding in or out and being easily accessible. The electric wiring is placed between the outer and inner metal parts of the removable top lid of the machine, so that nothing is exposed except the sockets for the bulbs and the circuit-breaker.

The egg trays are of heavy galvanized wire, and the sizes are graduated so that each single tray will hold about 100 eggs, making the trays easy for any one to handle. Where the dimensions permit, the egg trays are made in sectional squares, so that the position of the eggs relative to the center, sides and corners of the container can be changed without actually touching the eggs themselves. Solid removable bottoms with perforated sheet and sliding ventilators are provided. In addition to the asbestos lining, the dead-air space in the top is packed with mineral wool, and the sides with a triple layer of prepared paper and felt. The machine is equipped with double-glass windows in the door so that each part of the interior is always visible. A card slide is attached to the side of the machine for keeping records of the hatch.

The temperature of the incubator is controlled by a thermostat which automatically regulates and controls the degree of heat required in the incubator. When the temperature rises a quarter degree above the point at which the thermostatic circuit-breaker has been set the circuit is automatically broken and the current is shut off from the lamps. As soon as the temperature falls a fraction of a degree below the point at which the machine is set the circuit is automatically re-established.

FIG. 3—ELECTRIC EGG TESTER

At a rate of 10 cents a kilowatt-hour it is said to cost only a trifle more to hatch by electricity than by oil or hot water. Of course, where the rates are much lower the difference in cost is either eliminated or the advantage can be placed on the side of the electrically operated machine. It is claimed, however, that at the above-named price the small additional excess in cost is more than offset by the increased percentage of chickens hatched, the time saved over that spent in operating other devices for hatching and brooding, the absence of worry as to the outcome, and the superior vitality of the young fowls, together with the absolute lack of fire risk. The all-metal construction of the machine shown herewith permits it to be easily cleaned, and it is therefore far more sanitary than the old types of wood machines.

Of course, in producing chicks by artificial means the mere hatching of the eggs is only "half the battle." The chicks must be reared, and statistics show that only about one-half of the chicks hatched reach maturity. This large mortality is caused, it is claimed, by disease, usually the result of improper brooding. In the absence of the motherly hens to watch over the broods produced by artificial incubation, and especially to keep them warm at night, electrically heated hovers have been developed. In the illustration herewith is shown a hover which is of similar construction to that of the incubator described above, being of metal, light in weight, portable, and perfectly insulated. A curtain of felt is employed for providing shelter for the chicks. No thermometer is needed because the proper degree of heat necessary to rear the chicks is computed in advance, it is pointed out by the manufacturer, and the hovers are equipped with bulbs accordingly. The advantages of an electrically operated hover over one heated by kerosene or coal are similar to those which make the electric incubators superior to other types of machines.

In Fig. 3 is shown an egg tester of all-metal construction with a reflector, 6 ft. of flexible wire and plug attachment. This device is especially well adapted for use in eliminating nonfertile eggs from a prospective hatch. It may also be utilized as an egg-candling box. The apparatus described above has been developed by the Lo-Glo Electric Incubator Company, 76 Greenwich Street, New York.

Automatic Alarm System for Water Tanks

An alarm or signal system for providing a means of automatically supervising the "floating" water level in water tanks or other places between any predetermined points and indicating either maximum or minimum conditions has been developed by Louis Stern, 120 North Seventh Street, Philadelphia, Pa. The automatic circuit controller shown herewith is designed to

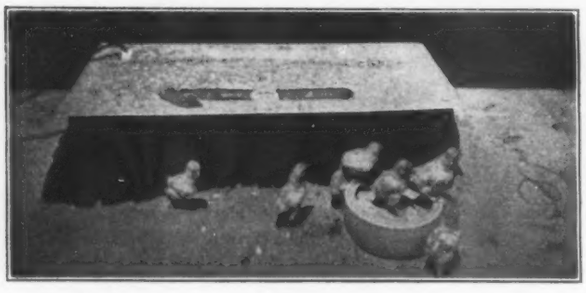


FIG. 2—HEALTHY CHICKS REARED WITH ELECTRIC HOVER

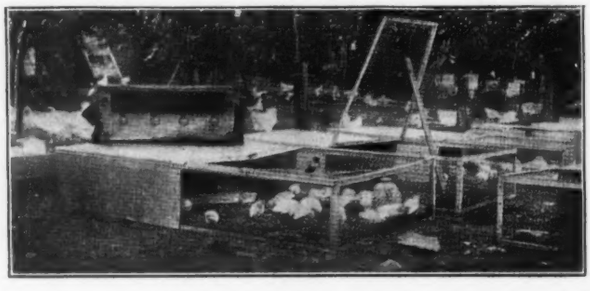
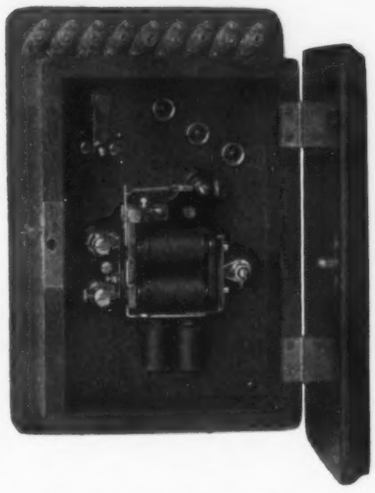


FIG. 4—MODERN CHICKEN FARM WITH ELECTRIC EQUIPMENT

cut off instantly the battery circuit from the tank float or other means of contact, hold the circuit open all the time the high-level or low-level contact remains closed, and then to close it as soon as the water moves toward a mean level and clears the contact. The action is accomplished by means of an "intermediate contact" placed very close to the high-level and low-level contact. The alarm is therefore always properly connected, it is claimed, so as to register either high-water or low-water levels without any attention on the part of the attendant. The alarm bells or visual indicating devices are operated by the closing of a local relay contact. The battery for operating the signal is arranged in two groups, one for the line and the other for local bells, thereby providing a system which is said to be very flexible and allowing for the variation of either line or local conditions



AUTOMATIC CONTROLLER FOR WATER-LEVEL SIGNAL SYSTEMS

or resistances without one interfering with the other. The manufacturer points out that the latest type of "Faraday" bells are utilized and that all parts of the system are easily accessible and adjustable. Three testing buttons are provided, as shown in the illustration, for testing the condition of the battery and the alarm bells. These buttons operate the bells and controller in precisely the same manner that the float does. The "Shamrock" tank float is employed in conjunction with the alarm system. The system requires four wires to be run to the water-tank float, but it can be connected to an old-style three-wire system by using a ground for one wire, thereby reducing the cost of wiring if there is an old system in use.

Aluminum Pole Tag

A solid-aluminum pole tag is being placed on the market by the Benedict Manufacturing Company, East Syracuse, N. Y., and was developed by a practical central-station man, the manufacturer points out, who wanted to eliminate the expensive process of stenciling poles on his company's lines. The tags can be numbered consecutively, and the initials of the company can also be shown if desired. The price of the tags varies, of course, with the price of aluminum, and is 100 per cent above that which it is when the price of the metal is normal. Figures given by the manufacturer state that

SOLID-ALUMINUM TAG FOR NUMBERING POLES

it takes a man, working at $3 a day, ten days to stencil 1000 poles. In ordinary climates the stenciling must be renewed every two years, making the cost of stenciling 1000 poles $15 a year, or $225 for fifteen years, the average life of the poles. On the other hand, 200 tags can be installed a day by one man, it is asserted, making the total cost of the tags (when these are bought in quantities of 1000 or more at the present price of 5 cents a tag) $50 for 1000 poles, which, plus the labor cost, figuring that the tags last as long as the poles, is much lower than the total cost for stenciling. The aluminum tags are also advantageous because they do not corrode or rust.

Electric Washer with Tubs Revolving Around Center Post

The washing machine shown in the accompanying illustration is so designed that the washer tub and the two auxiliary tubs utilized for rinsing or other purposes may be revolved around a single center post, so that they can be placed in different positions as required. The motor is placed above the drive wheel, as shown in the illustration, to reduce to a minimum the liability of danger from splashing. The washer is of quarter-sawed cypress wood with a heavy though narrow stave. The frame is of gray iron casting, while some of the parts are of soft steel and others are malleable castings. The revolving-tub feature, it is pointed out, permits the machine to be used in a small space. The tub rests can be taken off without removing a bolt. The machine is simple in design and can be taken down in a few minutes. It weighs 300 lb. complete. Camp Brothers & Company, of Washington, Ill., are placing this washing machine on the market.

ELECTRIC WASHER WITH TUBS THAT REVOLVE AROUND CENTER POST

Interchangeable-Letter Electric Sign

A recently developed type of interchangeable-letter electric sign which is particularly well adapted for use in front of motion-picture theaters where it is frequently desired to make new announcements in large display letters has been placed on the market by the Flexlume Sign Company, 1443 Niagara Street, Buffalo, N. Y. The sign is made up of relief letters of opal glass set in a neat and strong galvanized-sheet-steel box of length and width to suit conditions as to space allowed, the number of lines of letters required, etc. Longitudinal openings are left in the frame with grooves at the top of the openings within which are inserted the letter plates containing the raised letters. The great advantage of this type of sign, of course, is the rapidity and ease with which changes in lettering, without altering the lamps or wiring arrangement, can be made. Furthermore, it is pointed out, on account of the unusual clear reading qualities of the opalescent letters, more letters can be crowded into a narrower space than with the ordinary type of sign, so that greater efficiency can be obtained with comparatively small space. For an ordinary double-faced interchangeable-letter sign in three lines of letters, with letters 8 in. high, the width of the sign will be about 3 ft. and the length 10 ft., and twelve letters can be utilized in each line on a side. In this case forty-five 40-watt tungsten lamps would be required for brilliant illumination. The weight of such a sign, uncrated, would be about 600 lb. with all letters in place. The sign can be furnished in either the single-face or double-face types and for letters with heights of 4 in., 6 in., 8 in. or 24 in., as desired. The lamps and wiring are completely inclosed from the weather and may be colored. The background of the sign is finished in baked enamel and can be colored and trimmed to suit the taste of the purchaser. Illuminated borders and flashing effects can be built into the sign if desired.

INTERCHANGEABLE-LETTER SIGN IN FRONT OF THEATER

Door Switch

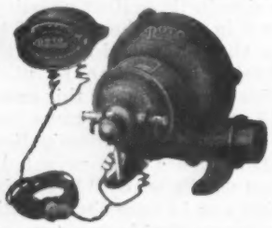
A door switch with a revolving button in the tip of the plunger has recently been developed by the Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn. When the door is closed the striking plate slides across the top of the plunger while pressing the plunger down. Without such a frictionless tip, the manufacturers point out that the sidewise thrust of the ordinary door switches is a very great strain on the mechanism

DOOR SWITCH WITH FRICTIONLESS TIP

and decreases materially the life of the switch. The switch is provided with a compensating mechanism so that a considerable shrinking or swelling of the woodwork will not affect the working of the switch.

Small Electric Blower

A small motor-driven blower which is equipped with a speed regulator so that it can provide any kind of blast desired is shown in the accompanying illustration. It is especially adapted for use in blowing forge fires and in candy factories where a concentrated heat is required for producing a blow-torch flame in connection with either natural or artificial gas. It may also be utilized in factories for blowing and exhausting foul air, lint, dust, etc., in coal-mining regions for forcing air into the fire boxes of residence-heating furnaces, where a cheap grade of coal or slack is used (in this case being automatically operated by a thermostat which engages the speed regulator), and in connection with hot-air furnaces for forcing hot air through the furnace pipes instead of allowing it to radiate, so that a building can be quickly heated in the morning or other time when desired (the speed regulator in this case being placed in one of the living rooms so that the blower can be

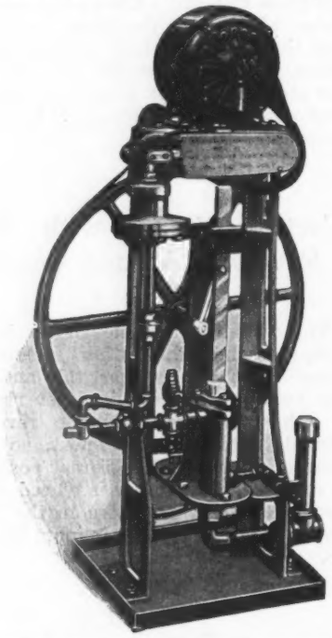


MOTOR-DRIVEN BLOWER WITH SPEED REGULATOR

started and stopped without going into the basement). The manufacturer of the device, the Rosewater Electric Company, 3110 Croton Avenue, Cleveland, Ohio, also points out that it is well adapted for use as a blower for cooling off and drying purposes in factories and also as a ventilator. The machine is operated by a 1/6-hp. motor and the blast fan is entirely of aluminum, giving a powerful blast, it is declared, with a minimum weight on the bearings. All parts are inclosed in a dust-proof case. Extra large bearings of anti-friction bearing metal and large self-feeding oil cups are also employed on the machine, which may be operated from an ordinary lighting socket.

Automatic Electric Water System for Pressure-Tank Use

The "Fig. 303 Hazel" automatic electric pumping system shown herewith has been developed for use in connection with pressure tanks of various sizes for supplying water in homes, thereby replacing hand pumps, water lifts, or other types of power pumps. It is automatic and practically noiseless in operation and will deliver approximately 1000 gal. of water for 6 cents with energy purchased at 10 cents a kilowatt-hour. The pump is designed



AUTOMATIC MOTOR-DRIVEN PUMPING OUTFIT

to maintain automatically a pressure of 20 lb. to 40 lb. in the tank at all times without attention from the user except for occasional oiling. The outfit consists essentially of a special type overload-start 1/6-hp. Emerson motor, which is fully inclosed to protect the interior windings from dampness of basements, a pump with drop-forged-steel crank shaft running in removable phosphor-bronze bearings, automatic starting and stopping device, 1.5-in. flat endless belt to extend from flanged pulley on motor to 20-in. drive pulley on pump, and automatic spring belt tightener, all of which are mounted on a strong cast-iron frame bolted to a heavy cast-iron base. To simplify the installation of the outfit, it is provided with relief valve, check valve, priming cock, etc., so that all that is necessary to place it in operation is to connect the suction and discharge pipes and the wires to the motor. The outfit is being placed on the market by the Columbus Pump Supply Company, 35 Vine Street, Columbus, Ohio.

Electric Stove

A complete and practicable stove for table cooking has been placed on the market by the Quick Electric Heater

ELECTRIC STOVE FOR TABLE COOKING

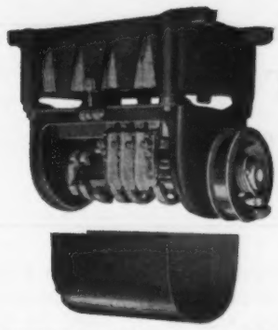
Company, Cincinnati, Ohio. The device measures 5 in. in diameter and is rated at 6 amp. at 110 volts. The stove is of cast metal and is nickel-plated, making it an attractive ornament for the table.

Fixture Fittings

A device which is designed for use with lighting fixtures to prevent the twisting of wires and which enables the contractor to wire the fixtures in the shop is shown herewith (front and back views). The fitting is used with an ordinary pipe and hexagonal lock-nut. After the fixture has been completely wired it is connected to the outlet and then the stem is placed in the slot and drawn down to the bottom. The surface against which the lock-nut rests is at a slight angle to the wall, and therefore the fixture is drawn up to the wall as the stem goes down. Only one turn of the fixture is required, it is claimed, to lock it securely. The manufacturer points out that with deep canopies without casings only a stem and a lock-nut are needed, but with shallow canopies and plates a piece of casing or fiber tubing is employed between the plates and the fittings for the fixture to press against. The fittings are especially well adapted for

FITTING WHICH PERMITS WIRING OF FIXTURES IN SHOP

use with shallow oval plates, since they obviate the necessity of using exposed screws. They are being made in two sizes to take ⅛-in. and ¼-in. iron pipe. The fittings are being put on the market by the Esler Electric Shop, 76 Chicago Street, Freeport, Ill.



CONTROLLER WITH COVER REMOVED

Rope-Operated Controllers for Small Cranes and Hoists

In the accompanying illustration is shown a recently developed reversible drum-type controller (inclosing cover removed) designed for overhead mounting with rope operation. Controllers of the type shown represent a new addition to the crane and hoist controller line of the Cutler-Hammer Manufacturing Company, Milwaukee, and are especially adapted for use indoors for intermittent-speed regulating duty, such as in crane and hoist service. Two standard types are being made, one giving 50 per cent speed reduction under one-half full-load current and the other giving 90 per cent reduction under light-load conditions. The first type, giving the 50 per cent reduction, is for general crane and hoist duty, while for foundries or wherever the average load must be handled by the crane at a steady, slow speed the controllers providing for the greater speed reduction are recommended.

Electric Condensation Outfit for Low-Pressure Systems

In the accompanying illustration is shown an electrically operated condensation outfit recently placed on the market by the Goulds Manufacturing Company, Seneca Falls, N. Y., for pumping condensation returns back into the boiler on low-pressure heating systems. This outfit consists of a "Fig. 3004" single-stage centrifugal pump, as it is called, directly connected to an electric motor with the motor and pump mounted on a common bed-plate. The tank is mounted on separate brackets, as shown, so that it may be placed where most convenient when the installation is made. This outfit can be furnished with pump for capacities up to 70 gal. per minute and with tanks up to 60 gal. capacity.

MOTOR-DRIVEN CONDENSATION OUTFIT

Automobile Electric Spot Lamp

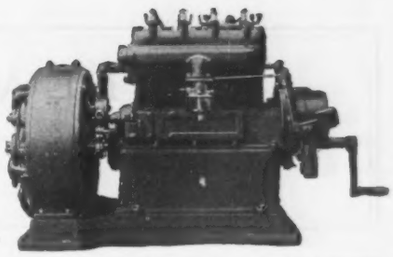
A device recently developed which is convenient for the use of automobilists for reading road signs, turning sharp curves, backing up, and for use in many situations where ordinary automobile lamps are not of service, is the spot lamp shown herewith. The lamp is equipped with a diminishing mirror at the back, as shown in the illustration, and is usually attached to the windshield within reach of the driver. It is equipped with a nitrogen-filled bulb and is being made in 8-in. and 6-in. sizes.

AUTOMOBILE LAMP WITH "REAR-VISION" MIRROR

The manufacturer points out that this spot lamp is especially useful for lighting the side of the road when an automobile the headlamps of which have been dimmed is passing another car, since it does not blind the approaching driver because the angle at which it is used is such that the light is turned on the ground. The lamp is being placed on the market by the Wood Manufacturing Company, Fairfield, Conn.

Small Generating Outfit

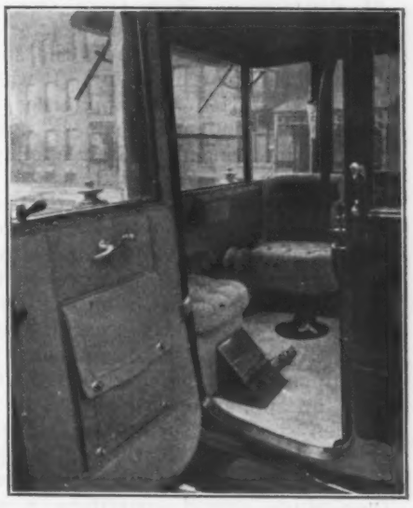
A compact directly connected gasoline-operated generating set has been developed by the Universal Motor Company, Oshkosh, Wis., especially for use in motion-picture houses and is being built with ratings of 40 volts, 60 volts and 110 volts for lighting 150 lamps. The set comprises a "Universal" four-cylinder, four-stroke-cycle engine with inclosed throttling governor, magneto and automatic oiling device. The engine may be connected by belt or directly to a 3-kw. generator of special design in which the armature takes the place of the flywheel. The set is also well adapted for use in wireless telegraphy, with searchlamps for boat lighting, in battery charging, and in house and store lighting. A noteworthy feature of the outfit, the manufacturer points out, is the smoothness of its operation, no flicker being produced on the lamps, no matter whether one lamp is used or the full number are in operation. The special governor is extremely sensitive in its action, it is declared, holding the speed uniform at all loads. The governor runs in an inclosed case of oil, where it is well lubricated at all times. The lubrication of all the other parts is taken care of by a vertical oil pump in the engine base driven from the cam shaft. The oil is pumped from the supply in the base to the sight feed, whence it flows to the gears and governor and to the drip pan below the connecting rods. The oiling is said to be complete and requires no attention other than filling the base and noting the supply by means of the oil gage. One or one and one-half gallons of oil can be poured into the base, affording a good supply for continuous service. The generating set is designed for an overload of 25 per cent.



SELF-CONTAINED GENERATING OUTFIT

Electric Automobile Radiator

An interesting development in electric heating apparatus is a two-section cast-iron radiator recently brought out by the Lee Electric Radiator Company, 319 Wells Street, Chicago, Ill., for use particularly in electric pleasure vehicles. It is 15 in. high and has a radiating surface of 3 sq. ft. Operating on an 80-volt battery circuit, it takes 3.9 amp. and attains a temperature of about 190 deg. Fahr. The principle on which the device operates is the same as that utilized with other types of radiators made by the above-named manufacturer, an open coil being submerged in an insulating fluid. The radiator is attached to a base plate, which in turn can be attached to the floor of the car, insuring its stability.



TWO-SECTION RADIATOR IN ELECTRIC CAR

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

Summaries Submitted for Report of Committee on Residence Lighting

The committee on residence lighting of the new N. E. L. A. Lighting Sales Bureau, of which Fred H. Scheel, Public Service Company of Northern Illinois, Streator, Ill., is chairman, is actively engaged in the preparation of a report showing various methods of securing residence business and giving details and results of those that have proved most successful. In compiling its report the committee has studied summaries on the subject of residence business prepared by T. H. Kettle of the Minneapolis General Electric Company, W. H. Wells of the Edison Electric Illuminating Company of Brooklyn, R. G. Gentry of the Denver Gas & Electric Company, W. P. Lyon of the Commonwealth Edison Company of Chicago, G. W. Rieger of the Philadelphia Electric Company, Earl E. Whitehorne, ELECTRICAL WORLD, and Charles B. Yonts of the Illinois Northern Utilities Company, all of whom are members of the committee.

Reports of Committees of the Jobbers' Association

The reports of several of the committees of the Electrical Supply Jobbers' Association presented at the Detroit meeting of that organization in February are of interest to other branches of the industry. The central-station committee in presenting its report expressed the opinion that the merchandising operations of certain central stations which are selling household appliances at reduced prices are retarding the growth of the appliance business. The committee, however, is open to conviction as to the correctness or incorrectness of its belief, and to establish definitely the truth in the case is collecting data from all the jobbers who are association members.

In the discussion of this committee's report the fact was pointed out that greater sales of an article can be effected from a number of strategically situated points of distribution than from one central point. One speaker cited the practice of the United Cigar Stores as an excellent example of the success to be achieved through this plan of selling. It was further held that if a central station sold appliances at reduced prices it made the appliance business unattractive for other dealers and tended to limit appliance sales to its particular store.

The standard-package committee presented a report which was full of helpful suggestions to manufacturers who wish to pack and ship goods in attractive and usable shape. Some of the suggestions follow: Locust pins should be packed in bags of 100 and 200. Machine bolts should be packed in cartons containing twenty-five and fifty bolts instead of in kegs. Line material should be shipped in strong cases bound with iron straps. Silk lamp or appliance cord should be wound on paper or wooden spools. Keyless sockets should be packed in standard packages containing 250 pieces. Pipe fittings should be packed in properly labeled cartons. Fifty fuse plugs should constitute a package. Lock-nuts should be packed in cartons. Linen tags, which are less easily destroyed than paper tags, should be placed on wire. Cord should be shipped in 250-ft. spools. Corrugated paper separators should be used in packing plug cut-outs to prevent breakage. Fixture parts should be packed in boxes instead of being wrapped in tissue paper.

The lamp committee reported that it had taken up with the lamp manufacturers the question of labeling cartons so they could be more readily understood by warehousemen. The present plan of marking with symbols was the cause of errors.

Cooking Lectures Demonstrated with Electric Ranges

In Milwaukee the *Free Press* recently arranged a free cooking school and exhibit at which electric ranges were used exclusively for demonstrating the cooking lectures. The school was continued for five days, with lectures on domestic economy and demonstrations of culinary art given each afternoon and two evenings by Mrs. Florence Austin Chase, a widely known authority on cooking. Mrs. Chase had previously been engaged for similar occasions by the *Free Press*, but always used gas ranges heretofore. Her demonstrations with electric ranges this year have brought this convenient means of cooking to the notice of many of Milwaukee's housewives. The lectures were given wide publicity through the reading columns in the newspapers and through large advertisements. The Milwaukee Electric Railway & Light Company displayed a complete exhibit of electric appliances during the lectures and loaned the electric ranges used.

Storm Damage in Northwest

Continued snow and cold weather throughout the month of January and the early part of February resulted in operating difficulties for public-utility companies in the Northwest. The fall of snow for January was heavier than that ever reported for that month before with the exception of one year. Early in February additional snow and sleet caused numerous interruptions to service in Portland, Seattle and in eastern Oregon and Washington. The power canals of the Pacific Power & Light Company in the Yakima and Walla Walla valleys in Washington were congested with ice, and steam plants were utilized to their full capacity. Even then some power loads had to be dropped. In the Portland district street-car traffic was greatly demoralized because of the inability to close some of the drawbridges after they had been opened. During the times when the thermometer got above the freezing point in the daytime the operation of large motor trucks threw slush on the street-car tracks that froze at night, making it very difficult to get the rails clear.

The first three days in February witnessed an almost complete demoralization of street-railway service, and heavy sleet hurt the arc-lamp circuits and transmission lines, causing some interruption to lighting service. It

is estimated that about 3000 telephones in Portland were put out of commission largely because of fallen lines and sleet.

The city of Seattle was almost completely shut off from the outside world by reason of the interruption to railroad and communication service. The railroad lines serving Seattle were so badly tied up that coal supplies became seriously depleted.

Public Service Commission News

Maryland Commission

As the result of a conference between representatives of light and power companies operating in Maryland and of the State Public Service Commission rules governing the electric service in the State were adopted and became effective Feb. 1. The rules are of two kinds —general and special.

The rules apply to all public utilities, including municipalities, selling electrical energy and may be amended by the commission upon complaint, upon its own motion, or upon the application of any utility. They do not relieve a utility of any legal obligations. Records of interruption to service must be kept, and inspection of plant and equipment must be in accordance with good practice to result in proper maintenance, the frequency of inspection depending upon size and character of plant.

All utilities must provide by May 1, 1916, one or more portable indicating voltmeters for testing voltage regulation, and if they have more than 250 consumers, they must provide in addition one or more portable recording voltmeters—at least one to register general regulation of the system. Voltmeter records are to be preserved for inspection. If meters are used, the utilities must provide before April 1, 1916, portable testing equipment as working standards and reference standards, which may be service-type wattmeters, the latter to be tested by the commission at least once yearly. Time, station demand and output, meter-test and meter historical records are to be kept by the utilities. The place where and the time during which records shall be preserved and the conditions under which old records may be destroyed are specified. Reports are to be made as required by the commission. The character of accidents to be reported and the method of reporting them are stated in the rules.

Investigation must be made of consumers' complaints and records kept. The utilities must have available for the consumers information concerning securing safe and adequate service, proper lamps and appliances, changes in condition of service, and reading of meters by consumers. The lamps furnished by utilities are to be equal in efficiency to those offered in open market. The meters must register in the same units upon which rate is based, and the dial constant must be plainly marked. Bills are to show details of meter readings and price per unit, and rules are given for readings of and collections from prepayment meters. No meter rental (not minimum charge) may be charged, and extension or installation of service can be made only under rules in published schedules approved by the commission. Rules are given covering deposits.

Continuity of supply is guaranteed by required periodical inspection, and maintenance records must be kept. A standard supply voltage or voltages must be adopted and maintained not to exceed allowable variations, but purely momentary variations are exempt under certain conditions. Standard voltage is defined, and the standard frequency adopted is to be maintained within certain variations under certain conditions. Meters must be tested before installation and be marked with the seal of the commission. Defects that prohibit a meter being placed or remaining in service without adjustment and correction are enumerated, and an allowable error upon installation of 1 per cent and in service of 2 per cent is made. Before installation meters must be tested at light and full loads, the definitions of and considerations governing which are stated. Meters are to be tested on request of consumers without charge under certain conditions. When tested by the commission a fee of $1 is charged, and the legal error in registration is 4 per cent fast. The conditions under which requested tests may be made either by the utility or the commission are given. Rules are stated for the maximum interval between periodic tests for different types of meters in service and for the time when installation tests are to be made for different types of meters. Meters showing more than 2 per cent error in registration must be tested at light, normal and full loads, while meters in error more than 2 per cent are to be adjusted to within 1 per cent. Tests on meters for service must be carried on at permanent locations.

Wisconsin Commission

In considering its own right to fix the height of water in a reservoir, consider property and flowage rights, etc., the Wisconsin commission held, in connection with the Bear Lake dam of the Wisconsin-Minnesota Light & Power Company, that in fixing the levels in question the commission must ascertain the facts after public hearings and find that the levels fixed will not interfere with navigation or other public rights, or fail to promote safety or to protect life, health and property, and that within such limits the levels fixed tend to the development of hydraulic power within the State; that the law thus has not failed to fix a definite rule to guide the commission in the exercise of the authority delegated. Also, the Legislature did not intend that the commission should consider property only in connection with the safety of the dam, but intended that it should also consider flowage rights and lands to be overflowed. However, where the flowage rights still to be obtained by purchase or condemnation are small in acreage and not of great value compared to the importance of the undertaking or the value of the flowage rights already obtained, the commission would not be warranted in fixing a level solely with reference to the small acreage over which rights have not as yet been secured, especially when, as in the present case, the fixing of the level without regard to the flowage rights already owned would destroy their value and render the dam practically valueless for reservoir purposes. It was held to be immaterial that in the present case the energy is not generated directly at the dam, for since the dam is used for hydraulic purposes, the utility is entitled to maintain such dam for reservoir purposes at the point in question and, under its charter, to build the dam to such a head and of such dimensions as are reasonably necessary to carry out the purpose of the grant.

It was further held that the level sought to be maintained by the utility would not be an unsafe level or endanger life or health, but that in order to protect property within the meaning of the act the maximum level should be fixed at a height not greater than that authorized in the flowage reservations naming the height as of June 21, 1902. The persons who took title to their lands subject to such or unlimited flowage rights cannot complain if those rights are exercised. As to the land over which flowage rights have not been secured, the dam owner has no right to flow the same, regardless of commission's action, until such right has been secured by purchase or condemnation.

Pope to Bless Wireless Telegraphy.—Following the ancient custom of the Roman Catholic Church in bestowing its blessing on inventions of great benefit to humanity, Pope Benedict, it has been announced, is preparing to give his pontifical blessing to wireless telegraphy.

Hood River Farmers Abandon Power Rights.—The water rights in Hood River, Ore., held by the Farmers' Irrigation Company for power purposes have been abandoned by vote of the stockholders, and the company's rights will pass to a private corporation to be organized. This was the only power site on the river owned by private interests.

Denver's New Distribution System to Be Ready for Use by Summer.—Work on the new switchboard and distributing system for the Denver Gas & Electric Company is well under way, and it is expected that the system will be in operation during the early summer. The present single-phase, 2000-volt system will be changed over to a 4000-volt, three-phase, four-wire grounded-neutral system. The cost will be $160,000.

Mining Company Tunnels Through Mountain to Tap Bottom of Lake for Power.—The Alaska-Gastineau Mining Company of Juneau, Alaska, has added an additional 12,000 hp. to its generating plant by driving a tunnel through a mountain and tapping the bottom of Annex Lake. Annex Lake is 1½ miles long, ¼ mile wide and about 200 ft. deep. The additional 12,000 hp. gives the company 18,000 hp. for use at the mines.

Bonuses of $20,000 for Hartford Electric Light Employees.—Employees' bonuses distributed by the Hartford (Conn.) Electric Light Company on New Year's Day, it has just been announced, amounted to approximately $20,000. The bonuses were distributed on the basis of 1.5 per cent of a year's wages for each year of continuous employment by the company, the maximum bonus to be $200. This year several employees received the maximum amount.

Germany Abandons Plans for Imperial Monopoly of Electric Plants.—It is stated in recent Berlin dispatches that the German government has definitely abandoned the plans which had been formulated for the imperial monopoly of all electric generating stations in the empire. This, it is stated, is partly because Saxony is about to establish a state monopoly of this character and partly because Bavaria is about to erect a very large central station without the monopoly feature.

Plans Being Drawn Up for Large New England Steam Plant.—Plans are being prepared for a large extension to the United Electric Light Company's plant in Springfield, Mass. The building is to be of concrete, brick and steel. When completed it is said it will be the largest steam-driven electrical plant in western New England. Steam will be generated by twelve boilers of 700 hp., capable of 300 per cent rating, equipped with automatic stokers. The equipment will include a 20,000-kw. turbo-generator with a jet condenser.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Dayton's New Power Plant to Be in Operation by Dec. 1.—If present calculations can be realized, the new power plant of the Dayton Power & Light Company will be completed and ready for operation by Dec. 1. Negotiations have been completed for the purchase of two steam turbines of 17,500 hp. each from the General Electric Company. The first of these units will be delivered between Oct. 1 and Oct. 15, the second between Nov. 1 and Nov. 15.

The Cost of Energy to Irrigate Rice Crop Electrically.—The cost of electricity for pumping in order to irrigate a rice crop of some 3000 acres, using energy from the lines of the Northern California Power Company, in 1915 ranged from $3 to $6 per acre, depending largely on the character or density of the soil. Rice requires continuous irrigation during a season of cultivation, and in ample quantities, the duty of water for this crop being about 60 in.

Protection of Investor Not of First Importance with Michigan Commission.—Attorney-General Fellows of Michigan holds that it is within the province of the Michigan Railroad Commission to inquire into the reasonable certainty of stocks and bonds authorized by the commission paying the interest or dividends, and that the primary object of the law is not the protection of the investing public but the extension of public utilities within reasonable lines and on reasonably safe grounds.

Revision of Rates for Twelve Illinois Cities.—A revised schedule of rates prepared by the Central Illinois Public Service Company affecting twelve cities in Illinois has been approved by the Illinois Public Service Commission. Some classes of service received a reduction and others a revision of the rate. The new residential rates range from a maximum of 14 cents per kilowatt-hour to a minimum of 8 cents, with a discount of 1 cent per kilowatt-hour. Employees receive half rates. Commercial rates have the same maximum as domestic rates but a 5-cent minimum.

Transatlantic Radio Plant Suffered Heavily from Sleet.—After having been out of service for more than three days, the sending apparatus of the Sayville (L. I.) wireless station resumed operation on the evening of Feb. 16. The inactive period was the longest lapse in the sending service the station had suffered since it was established. The sleet and snow incased the wires in an inch and a half of ice, so that they sagged and broke under the weight. They became entangled, and workmen were hampered by the severe cold in repairing them. The receiving apparatus was not affected by the storm.

Plan to 'Copyright" City's Lighting System.—A movement is under way to give the name of the "Salt Lake City Street-Lighting System" to the illumination scheme W. D'A. Ryan has designed for Salt Lake and to have the name used for this lighting system wherever it may be adopted throughout the country.

Customers to Be Protected by Meter Card System.—Mayor Coakley of Chicopee, Mass., has announced that he has inaugurated a new scheme for the protection of electric-light users of that city. Each consumer is to be provided with a card, and each time the meter is read the amount will be recorded. In this way the consumer can keep a separate account.

Work Begun on Line to Supply 20,000-Hp. Contract.—The construction of a new power-transmission line by the Niagara, Lockport & Ontario Power Company to supply the Union Carbide Company at Niagara Falls with 20,000 additional horsepower was begun on Feb. 9. The total length of the new line will be about 8 miles. Copper cable will be used entirely, aluminum cables having been discarded.

Oregon City Takes Over Private System.—The negotiations for the sale of the Oregon Electric Company's distribution system in Eugene, Ore., and outlying districts to the city of Eugene are reported to have been completed, and from now on the lighting business, both commercial and street lighting, will be carried on by the city. It is stated that the price paid by the city of Eugene approximated $150,000.

Labor Costs 38 per Cent in Manufacture of Electrical Goods.—The latest available reports of the Pennsylvania Bureau of Industrial Statistics give the labor cost of more than $30,000,000 worth of electrical supplies manufactured in the State in 1912 as 38 per cent of the total value. Next to mining and preparation of coal this is the largest labor cost in percentage of all industries in the State of Pennsylvania.

Submarine Officers and Men Receive Instructions on Lead Batteries.—More than 100 officers and men of the submarine flotilla of the United States Navy have received instructions in the manufacture and operation of the lead storage battery at the works of the Electric Storage Battery Company of Philadelphia. The course, which was laid out by that company, was approved by Admiral Grant and his aide, Captain Sterling, and was sanctioned by Secretary Daniels.

Connecticut May Have Half a Million Less Poles.—Elimination of about 500,000 wooden poles throughout Connecticut is a possible outcome of a session of transmission engineers of Connecticut named by the light, power, telephone and telegraph companies. Under the plan projected and about to be submitted for the approval of the utilities commission one group of poles in a locality may serve all purposes. At present telegraph, electric-light and telephone companies might have three parallel rows of wooden poles across country.

Output of Electric Vehicles Increases 22.9 per Cent in Five Years.—The government census of the manufacture of automobiles for 1914 shows that of the automobiles manufactured in 1914 those operated by gasoline or steam power numbered 569,399 and those operated by electric power 4715, as compared with 123,452 operated by gasoline or steam and 3835 by electric power manufactured in 1909. The increase during the five years in the number of gasoline and steam machines manufactured was 360.4 per cent, and in the number of electric vehicles 22.9 per cent.

St. Louis Lighting Inquiry Evidence Completed.—The examination of officials of the lighting companies of St. Louis, Mo., has been completed in the aldermanic investigation into the feasibility of a municipal lighting plant, according to the chairman of the special committee, and a report will be compiled chiefly from the evidence already gathered. Since the committee felt it should have the evidence in hand analyzed by experts, it will probably be several months before a report is made. The investigation, which was begun last June, included in the fall a series of public hearings at which officials of the Union Electric, Laclede Gas, United Railways and Cupples Station Light & Power companies were questioned.

Nation Receives Preparedness Message by Wireless.—Within one hour and a half after being sent out by wireless from the Rock Island Arsenal near midnight Feb. 21 the preparedness message authorized by government officials was received through various relays in all corners of the country. The demonstration, which was part of a test of the preparedness of the nation's 25,000 licensed amateur operators, involved the sending of the following message: "A democracy requires that a people who govern and educate themselves should be so armed and disciplined that they protect themselves." Boy scouts were on hand on Washington's Birthday to deliver the message to the various city and state executives throughout the country.

Large Power and Irrigation Project in Washington Under Consideration.—The Pasco (Wash.) Chamber of Commerce is back of a proposition to develop an immense power and irrigation project which will water 73,500 acres of land near Pasco. The proposition to construct a 40-ft. dam on the Snake River at Five-Mile Rapids and the development of 40,000 hp. available all the year is under contemplation. Accordingly the Chamber of Commerce has engaged the services of E. G. Hopson of Portland, Ore., consulting engineer of the United States Reclamation Service, to make the investigation and a preliminary report and to estimate the cost. According to Mr. Hopson, the plant by a new installation could be made to produce an additional 80,000 hp. as secondary power available for ten months in the year. It is stated that surplus power could be sold for $10 per horsepower at the plant at a profit sufficient to cover entirely the operation and maintenance charges of the system.

Electric Flag Campaign Receives Colorado Governor's Indorsement.—C. N. Stannard, secretary of the Denver Gas & Electric Light Company, has received a letter of indorsement of the electric-flag idea from Governor Carlson of Colorado, which reads as follows: "The campaign of the electric interests throughout the country to install electric American flags on public buildings, churches and factories in the different cities and towns is a splendid undertaking and cannot help but quicken the patriotism of our citizens. I am pleased to give the plan my most hearty indorsement."

Muskogee Company Makes 2000-Ft. Line Extension and Power Installation in Quick Time.—After fire had destroyed the general shop building of the Midland Valley Railroad Company in Muskogee, Okla., on Feb. 3, an application was made to the Muskogee Gas & Electric Company the next morning for temporary service, to furnish which it was necessary for the company to make a 2000-ft. extension of the electric distribution system and set seven poles. At 7 o'clock in the evening of the same day all work had been completed and service established for a 10-hp. motor to operate the coal chutes and a 7.5-hp. motor in the woodworking shop. A 40-hp. motor was installed later for the operation of the machine shop.

Two More Doherty Cadet Schools.—In view of the success of the school of gas and electric practice operated in connection with the Denver Gas & Electric Light Company, it has been announced that two additional schools will be operated by the Doherty organization. One of these will be at Toledo and the other at Bartlesville, Okla. Twenty new cadets will be engaged to join the Denver school, whose courses about fifteen men are now attending. Thirty cadets will be enrolled at the Toledo school, to be operated in connection with the Toledo Railways & Light Company. The Toledo cadets will not only study electricity, but will have the benefits of street-railway instructions, which Denver does not furnish. At the Bartlesville school ten cadets will be instructed.

Part Paid by State and County in Footing Highway Lighting Bills.—In gathering data for the report of the National Electric Light Association's Lighting Sales Bureau's committee on municipal and highway lighting, the secretary of each state in the Union was consulted for information regarding highway illumination which is paid for by the state or by counties. About 90 per cent of the states were heard from to the effect that no moneys were ever expended for this purpose or that the subject had never received consideration. The rapid increase of traffic during the night, for which the automobile is largely responsible, calls for the safeguarding of public highways by illumination, and it is expected that the committee will incorporate in its report some ways and means for bringing about a movement to interest state governments in the safeguarding of at least the principal highways by illumination.

Pittsburgh Rates Reduced.—Announcement has been made by the Duquesne Light Company of Pittsburgh of a reduction in rates for electric energy to domestic and commercial consumers, to take effect with the meter readings of April 1. The present rate for this service is 11 cents per kilowatt-hour, with 1 cent discount for prompt payment. The new rate will be 10 cents per kilowatt-hour with a discount of 1 cent for prompt payment. Decreased cost of station operation and reduction in the expense of transmission by reason of the growing density of the domestic business of the company have made possible the lower charge.

Private Lighting for Business Street.—Sixth Street from Elm Street to Sycamore Street, Cincinnati, Ohio, will have a boulevard light system as soon as the Union Gas & Electric Company is ready to install it. There will be fourteen lights to the square, seven on each side of the street, or seventy lamps in all. The standards will be a little over 12 ft. high, and there will be a single 500-watt lamp at the top of each. The company requires the property owners to sign two-year contracts at the rate of $2 per front foot of property the first year and 90 cents for the second year. The lamps are to be lighted from dusk until midnight every night.

Ontario Power Company to Build Another Pipe Line for Additional Power.—The Ontario Power Company plans soon to construct a third pipe line to bring the amount of power it can generate at Niagara Falls, Ont., up to about 180,000 hp. Work will begin early in the spring, and about two years will be required to complete the work. The pipe line will be about 6000 ft. long and will parallel the two present lines. It will be of concrete, 18 ft. in diameter. When the contemplated improvements are made the equipment of the Ontario power house will include sixteen units. The largest unit now in operation there is rated at 14,000 hp.

Work to Be Resumed on Holter Development.—F. M. Kerr, general manager of the Montana Power Company at Helena, Mont., reports that definite steps will be taken immediately regarding the project of constructing the Holter power plant and dam, situated 30 miles from Helena. The original plans for the development of the plant call for a plant generating 6000 hp., a dam across the Missouri River 1400 ft. at the highest elevation, and an average height of 130 ft. Seven main hydraulic units, three exciter units and an auxiliary unit are provided for in the original plans. The dam, which will create a lake 25 miles long, together with the power plant, will cost from $3,000,000 to $3,500,000 and will take from two to two and a half years to build. The development, which is situated near Wolf Creek, was started in 1908 by the Missouri River Power Company, this company having been forced to suspend its operations two years later on account of financial difficulties that were encountered at that time.

Kansas City Jovian League.—A rejuvenation and joviation was held at Kansas City on Feb. 24.

Los Angeles Section, A. I. E. E.—A meeting of the Los Angeles Section, American Institute of Electrical Engineers, was held on Feb. 23, when E. E. Valk presented a paper entitled "The Panama Canal and Its Electrification."

Cleveland Electrical League. — On Feb. 10 A. A. Worman, vice-president of the Fowler-Worman-Kelley Company, spoke at the regular luncheon meeting of the Electrical League of Cleveland on "Brass Tacks Talk About People."

Los Angeles Jovian League.—The regular weekly meeting of the Los Angeles Jovian Electric League was held on Feb. 16, when ex-Senator L. H. Roseberry, trust attorney with the Security Trust and Savings Bank, spoke on the subject of "Wills."

Worcester Polytechnic Branch, A. I. E. E.—At the fourth regular meeting of the Worcester Polytechnic Institute Branch of the American Institute of Electrical Engineers, C. R. Underhill, chief electrical engineer of the Acme Wire Company, spoke on the subject "Electromagnets."

St. Louis Jovian League.—Walter S. Donaldson of the National Printing & Engraving Company addressed the Jovian League of St. Louis, Mo., on Feb. 8 on the topic "Advertising," urging the Jovians to consider the subject of "National Advertising" in the electrical trade journals.

New York Electrical Society.—The 344th meeting of the society was held in the Engineering Societies Building, New York City, on Feb. 25. Elmer A. Sperry, president of the society and member of the Naval Consulting Board, gave an address on "The Principles and Operation of the Gyroscope."

Detroit Jovian League.—Arthur Von Schlegall, general manager of the Michigan State Telephone Company, delivered an address before the Detroit Jovian League on Feb. 12 at the Board of Commerce in which he declared that measured service was the only solution of the overcrowded telephone situation in any large city.

Pittsburgh Section, A. I. E. E.—The February meeting of the Pittsburgh Section, American Institute of Electrical Engineers, was held in the rooms of the Engineers' Society of Western Pennsylvania on Feb. 8. Dr. Saul Dushman, research laboratory, General Electric Company, Schenectady, N. Y., presented a paper on "Latest Theories of Magnetism."

Minnesota Section, A. I. E. E.—At the meeting of the Minnesota Section of the American Institute of Electrical Engineers, held on Feb. 21, at the University of Minnesota, Minneapolis, Minn., the following papers were presented: "Excitation of Synchronous Machines," by Theodor Schou, chief designing engineer of the Electric Machinery Company, Minneapolis, Minn., and "Electric Starting Equipment for Automobiles," by T. H. Edwards, Edwards Walker Company, Minneapolis.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Pittsfield Section, A. I. E. E.—An address on the "Application of Electron Emission to Electrical Engineering" was made by Dr. Saul Dushman of the General Electric Company's research laboratory at Schenectady before the Pittsfield Section of the American Institute of Electrical Engineers on Feb. 10.

New York Section, E. V. A.—The February meeting of the New York Section of the Electric Vehicle Association of America was held on Feb. 23. A paper on "High-Rate Discharging and Charging of Lead-Acid Batteries" was presented by Joseph H. Tracy, assistant chief engineer of the Electric Storage Battery Company.

Lynn Section, A. I. E. E., and New England Section, I. E. S.—W. D'A. Ryan, who was the chief of illumination at the Panama-Pacific International Exposition, lectured on Feb. 16 at a joint meeting of the Lynn Section of the American Institute of Electrical Engineers and the New England Section of the Illuminating Engineering Society.

Electrical Contractors of Western Massachusetts.—The Electrical Contractors' Association of Western Massachusetts at its recent annual meeting elected the following officers: A. J. Newell of Rowland T. Cakes Company, president; F. F. Touhey of Springfield, vice-president; T. J. Lynch of Holyoke, treasurer; T. J. Collins of Springfield, secretary.

Detroit Engineering Society. — The next meeting of the Detroit Engineering Society will be held on March 3 at the society's hall. Allen Rogers, Ph.D., of the laboratory of industrial chemistry, Pratt Institute, Brooklyn, N. Y., will talk on "The Manufacture of Leather from the Hide to the Finished Product." Samples will show the condition of the material at every stage of the process.

Vermont Electrical Association.—A meeting of the Vermont Electrical Association was held at the Woodstock (Vt.) Inn on Feb. 11. A technical address was given by William Clark of the General Electric Company, Boston, on "The Oil Switch, Its Design and Use." F. H. Parker of the Burlington Electric Light & Power Company gave an informal talk, with pictures, on the power development recently made by his company at Essex.

Engineers' Society of Western Pennsylvania.—Addresses by men of nation-wide prominence marked the annual banquet of the Engineers' Society of Western Pennsylvania held on Feb. 14 in Pittsburgh. S. Stanwood Menken, president of the National Security League, New York, spoke on "The Crisis in the Preparedness Program"; Alba B. Johnson, president of the Baldwin Locomotive Works, Philadelphia, Pa., discussed "Business Conditions After the War"; Samuel Insull, president of the Commonwealth Edison Company, Chicago, Ill., spoke on "Universal Electricity Supply," and Wilbur D. Nesbit, author, gave a humorous address called "Conversational Engineering." Walter Riddle of Pittsburgh was toastmaster.

Radio Club of America.—At the close of the February meeting of the Radio Club of America, held on Feb. 18 at Columbia University, in New York City, the election of Prof. J. Zenneck to honorary membership in the club was announced. Earlier in the evening Professor Zenneck presented a paper in which a comparison was first made of the efficiencies of two methods of transmitting signals, the efficiency in each case being considered from the viewpoint of the energy received at the receiving station. Conclusive proof was offered that the greater efficiency is attained when signals are transmitted by intermittent generation of energy in the antenna circuit rather than by regulation of the wave-length of continuously radiated energy.

Oregon Electrical Contractors and Dealers.—The Oregon Electrical Contractors and Dealers' Association met in Portland, Ore., recently, reorganized and adopted a new set of by-laws and code of ethics. Under the new organization, central-station men, jobbers and others not actually retailing or contracting in the electrical line, but who manufacture or deal in energy or electrical equipment, are admitted to associate membership in the State organization. The officers elected are as follows: W. O. Fouch, Western Electric Works, president; S. G. Jagger, Morrison Electric Company, and J. Tomlinson, Pierce-Tomlinson Electric Company, vice-presidents. The two last named and F. C. Greene of E. L. Knight & Company and Guy C. Littler of the West Coast Engineering Works form the board of trustees.

Engineers Discuss Preparedness at Boston Banquet.—The seventh annual banquet of the Boston sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, together with the Boston Society of Civil Engineers, was held at the Boston City Club on Feb. 8. President Charles L. Edgar of the Edison Electric Illuminating Company of Boston was toastmaster, and the speakers were Governor McCall of Massachusetts; Col. W. E. Craighill, corps of engineers, U. S. A.; William B. Parsons, consulting engineer, New York; John R. Freeman, consulting engineer, Providence, R. I.; Calvin W. Rice, secretary American Society of Mechanical Engineers, New York, and Dr. John A. Brashear, Pittsburgh, Pa. About 500 engineers attended. Governor McCall emphasized the possibilities of securing economy in governmental administration under engineering advice, and Colonel Craighill and General Parsons outlined the functions of the engineer in national defense.

FINANCE, COMMERCE AND INDUSTRY

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Manufacturing and Industrial

Prospects Good for 1916 Ornamental-Lighting-Standard Season

Judging from the inquiries received and the invitations to make estimates on installations, the 1916 sales in ornamental lighting standards will be up to standard. Winter time, because of weather conditions, is the off season in every part of the country that is affected by frost, because cities are averse to tearing up the streets in the winter except when absolutely necessary. The time for installation of street-lighting equipment is later in the year in anticipation of the coming months of long lighting hours. Although the height of the season is some months away, manufacturers of this class of equipment with almost no exception are pleased with the prospects for 1916. The demand will not be phenomenal, but it will be normal. Last year was an especially good year—a number of large installations having been made—and this year is expected to show a normal increase owing to the normal growth of the industry.

Ornamental lighting standards are purchased mostly by municipalities. In the beginning the lighting companies furnished the street posts and the lighting equipment. Then individuals began to place isolated standards in front of their stores (creating on the whole rather a heterogeneous equipment). Next the business men's organizations became interested and urged "white-way" installations privately owned but of a standard character. Finally the bulk of the purchasing of street-lighting equipment has fallen to the municipalities. Public ownership of this type of equipment seemed to be as just as the private ownership of the lighting equipment of one's home. However, there is still a considerable purchasing power left to the utilities in this field, although it is felt generally that it is growing less and less.

Owing to the character of this business it is not one to be closely affected by general conditions. Whether it is to be owned by the lighting company or the municipality, the installation of new equipment is governed largely by political or civic motives and not largely by business conditions. Business conditions find their reflection most in the privately owned "white-way" installations for business blocks. This business, however, because of its novelty and the recent introduction of the gas-filled lamp, has not been seriously curtailed. With the exception of New York City and one or two installations in New England and in the South, there had been little or no demand for street-lighting equipment east of Pittsburgh for some time. West of Pittsburgh, however, business is excellent, many inquiries are being received, and a large volume of buying is expected.

Prices have gone up generally and are expected to rise still more, although one manufacturer stated that owing to the competition of small foundries it was found necessary to make no increase in price in order to obtain the business. In fact, wherever the orders were small it was found by all manufacturers that the small-foundry man could and did offer better prices and deliveries. Most poles are made of cast iron, of which the price has not risen very much. The reason, therefore, for the increase in prices is to be found, not as with other electrical goods in increased cost of raw materials, but in the law of supply and demand. Manufacturers of ornamental standards are simply overstocked with orders, not for standards, but for all kinds of castings. The shops are so overcrowded that the consumer must pay more for his standards if he wants the manufacturer to work on them. It is the crowding of the shops, therefore, by all kinds of castings that is increasing the price of lighting standards.

Deliveries will not be so good as formerly. Because of the crowded conditions in the shops, labor, freight, etc., actual deliveries will be some weeks longer than formerly.

Where competition with small foundries has been felt credits have been lengthened and collections therefore have become poor. On large orders where this competition is not felt credits and collections are good.

Most of the equipment now being ordered calls for cast iron, which material is constantly increasing in favor. Pressed-steel equipment has been tried and is still being used, but owing to its limitations it is not finding the demand of the cast-iron pole. For outside weather conditions, it is stated by metal men, nothing, with the exception of bronze, bears up so well as cast iron. Steel deteriorates quickly in comparison with cast iron. The advantage of toughness claimed for the steel pole has resulted in different solutions of the problem by the cast-iron-pole manufacturers. A common treatment is to use a wrought-iron core and a cast-iron shell. The core provides all of the toughness and pliability necessary. Some manufacturers overcome the brittleness of cast iron by mixing with the iron certain other ingredients. Other manufacturers, provided that the customer wishes to pay the price, make a very heavy standard which has been found to give satisfactory service. Steel poles are more expensive than cast-iron poles, especially for the tall standards, and with the present conditions obtaining in the steel market prices are necessarily considerably higher and deliveries very much delayed.

The Ward Leonard Electric Company, Bronxville, N. Y., manufacturer of controlling devices, has appointed the John B. Sebring Company, Baum Boulevard and Euclid Avenue, Pittsburgh, Pa., as its district sales agent.

The Acheson Graphite Company.—The International Acheson Graphite Company of Niagara Falls, N. Y., has changed its name to the Acheson Graphite Company. The company is engaged in manufacturing graphite artificially in electric furnaces.

The Mohawk Electrical Supply Company, 329 South Warren Street, Syracuse, N. Y., recently appointed A. M. Little, formerly its vice-president and manager, as its president and manager. The company is intending to issue some time in May or June a 1000-page general-supply catalog.

The Barrett Company.—The American Coal Products Company, 17 Battery Place, New York, parent organization of the Barrett Manufacturing Company, has changed its name to The Barrett Company. The company will deal in various building materials, coal-tar products, oils, chemicals, etc.

The Moloney Electric Company, St. Louis, Mo., has just opened an office at 50 Church Street, New York. This office will be in the charge of C. H. Abbott, who has been in the employ of the company for the last five years. All the business of the company in the New England States will be handled through this office.

Enlargement of Lamp Works Contemplated.—It is reported that the National Lamp Works of the General Electric Company, Cleveland, Ohio, are contemplating an addition to their plant so as to give room for about 1000 more employees. The addition will, it is said, be built on land adjacent to their present plant.

The Holophane Glass Company, Newark, Ohio, has appointed G. W. Roosa a member of its sales force, and he will have charge of sales of Holophane glassware in New York, Ohio and western Pennsylvania. Mr. Roosa has for several years been connected with the lighting department of the Westinghouse Electric & Manufacturing Company.

The Pratt Electric Company, 1342 South Meridian Street, Indianapolis, Ind., has recently been incorporated and has taken over the business formerly conducted by the H. F. P. Electric Company. The company is acting as an electric contractor and does a general business in lighting fixtures and repair work. H. F. Pratt is president and treasurer, E. W. Hohlt secretary, and A. T. Pratt vice-president and financial secretary.

The Reynolds Electric Company, Santa Barbara, Cal., has recently appointed H. E. Stillwell of Los Angeles to take charge of its indirect-lighting-fixture department. Because of the largely increased demand for lighting fixtures, especially those of the indirect-lighting type, the company has been forced to enlarge the above-named department. In this city there is an especially large demand for indirect-lighting fixtures from stores and for high-class residential work.

W. N. Matthews & Brother, St. Louis, Mo., recently acquired the business of the Triple Tool Company, Jacksonville, Ill., manufacturer of the "Goheen" digger, which was described in an article entitled "Adjustable Pole-Hole Digger" in the ELECTRICAL WORLD of Nov. 6, 1915. W. N. Matthews & Brother will continue the manufacture of this post-hole digger and will call it the "Spoovel" digger. Following their usual custom they will guarantee this device against defects and will ship any number of them on thirty days' free trial to any point within the United States.

Desires to Become Agent for Manufacturers in Italy.—In a letter to the Reliance Electric & Engineering Company, Cleveland, Ohio, Morris W. Gowen, Villa "Marta" Antignano, Leghorn, Italy, states that he would like to get in touch with manufacturers of electric fittings, lamps, insulators, etc., and that he is interested in forming agencies in the cities of Leghorn and Pisa. Mr. Gowen has lived in Italy for more than twenty years and is in an excellent position, he declares, to carry on business in that country. Mr. Gowen also states that he would like to receive catalogs and lists of prices of materials from the various manufacturers.

Big Business for General Electric Company.—During the last few weeks, it is reported, the General Electric Company, Schenectady, N. Y., has been noting an unprecedented increase in its business. If orders should hold for a full year, it is said, at the rate which has prevailed for the past few months, it would mean something like $150,000,000 for incoming business, which would mean a 32 per cent increase over that of the previous big year (1913), for which orders totaled $113,000,000. It is thought, however, that the abnormal influx of business will lessen in the near future, since many customers are buying more than they need in anticipation of advanced prices. Owing to the large increase in prices of such raw material as copper, zinc, platinum and lead, a general advance in prices is expected.

Glass Prices Increasing.—On account of the large increase in the cost of raw materials, together with an advance in labor and fuel costs, the Macbeth-Evans Glass Company, Pittsburgh, Pa., has been forced to raise the prices of its glassware for electric-lighting fixtures. For some time, the company reports, it has been experiencing difficulties in obtaining workmen for its various plants. Quite recently, also, certain laws have been passed by the Legislature of Pennsylvania shortening the working hours, which, the company declares, is equivalent to an advance in the wage scale. Business conditions in the glass industry just now are good. Imports have been practically cut off and, furthermore, owing to the fact that the great glass plants in Belgium, Austria and Germany have been shut down, the American concerns are supplying glassware for use in practically all countries.

H. W. McCandless & Company, 67 Park Place, New York, manufacturers of miniature incandescent lamps, have recently leased the eleventh and twelfth floors of the building at 406-426 West Thirty-first Street, New York, which are being equipped with machinery for the manufacture of miniature lamps. Eventually it is the intention of the concern to move its offices to the new address. H. W. McCandless & Company have been noting a large increase in their business and have had to increase their output considerably. Numerous orders have been received from foreign countries, particularly from the belligerents. There is an ever-increasing demand, it is declared, for miniature lamps for war purposes, and they are employed as gun-sight lamps and for reading instruments on battleships and aeroplanes. Many lamps are also needed for renewals on automobiles in the war zone on account of smash-ups.

List of Average Central-Station Voltages.—The Edison Lamp Works of the General Electric Company, Harrison, N. J., are co-operating with other manufacturers of "Mazda" lamps in the preparation of a booklet giving the average voltage at the lamp sockets of customers on the circuits of central stations in every town in the United States where there is electric service. This information will be for use by salesmen and agents, in order that they may supply lamps with the proper voltage for the use of customers on the central-station circuits. The undertaking to get this information has been quite difficult, since there are about 10,000 cities and towns in the United States having electric service. No attempt is being made to distinguish whether the service is alternating current or direct current or, if alternating current, the frequency of alternation, as this information is not necessary for use in operating incandescent lamps. It is believed that the information obtained will help to popularize the use of incandescent lamps, since the lamps will be more generally operated at the voltage for which they are designed, and therefore will give more efficient light. It is the intention of the manufacturers to print booklets with the above-named information from time to time to keep them up to date.

Trade Literature Wanted.—C. W. A. Veditz, commercial attaché accredited to Belgium, Switzerland, France, Spain and Portugal, with headquarters at 36 Avenue de l'Opéra, Paris, France, in a letter to the ELECTRICAL WORLD states that the various commercial attachés of this country whose offices are in the commercial districts of various capitals of foreign countries have been gradually building up libraries of commercial reference publications and of trade periodicals in lines which promise further development in our export trade. Mr. Veditz states that at the above-named address a room has been set aside as a sort of reading-room in which are available publications of the above-mentioned character, as well as catalogs, commercial directories and the like, which are constantly available to French inquirers seeking information with regard to American goods and American firms. "Every day we receive numerous inquiries," Mr. Veditz says, "from French firms and individuals seeking to obtain the names and addresses of American manufacturers or dealers in different lines of products. These inquirers are furnished with such information as we may be able to provide. Often we can place in their possession trade publications relating to the particular line in which they are interested, and sometimes our correspondence files contain detailed letters from American houses which are actively seeking purchasers or agents in the countries that constitute my territory." Mr. Veditz is especially desirous of obtaining complete sets of catalogs and other published material from American concerns actively interested either in starting a campaign for foreign markets or in developing such foreign markets as they may already enjoy.

Unprecedented Increase in Expenditure for Copper in 1916.—The National Conduit & Cable Company, New York, estimates that if the present prices for copper hold for the remainder of the year $200,000,000 more will be paid for copper in 1916 to the United States producers than was paid in 1915. For prompt delivery the market is now 28 cents to 28½ cents a pound, while for deliveries in September, October and November the price is 26¼ cents to 26¾ cents. The tendency in prices is still upward. "It is apparent enough that copper is being steadily consumed in record proportions, and conclusive evidence coming to hand points unquestionably to a year of great manufacturing activity in brass and copper," the company states. "But while the confident belief exists that the present heavy rate of consumption will be maintained for months at least, conservative buyers would deprecate a runaway market. For the sake of reasonable market stability it is indispensable that rigid effort shall be used to prevent wild price inflation. The radical readjustment of prices which has taken place in the last three months is the most pronounced in many years. To a large extent the trade is traveling an un-

beaten path, and it should be made as safe as possible. If the present enormous movement into consumption keeps up during the last half of the year, as it seems likely to do during the first half of 1916, current output of copper must needs be maintained at a high rate also. The situation is admittedly capable of extraordinary possibilities. The course of quotations reflects the great change in conditions compared with a year ago. The market price of copper is from 11 cents to 12 cents a pound higher than it was a year ago. On the basis of the estimated refinery output for 1915 the increase in the commercial value of American production of, say, 12 cents a pound would be equivalent to the enormous sum of $197,640,000 per annum."

NEW YORK METAL MARKET PRICES

	Selling Prices Feb. 15 Bid	Asked	Selling Prices Feb. 21 Bid	Asked
Copper	£ s d		£ s d	
London, standard spot	106 10 0		108 0 0	
Prime Lake	28.00	to 28.50†	28.00	to 28.50†
Electrolytic	28.00	to 28.50†	28.00	to 28.50†
Casting	26.50	to 27.00†	26.50	to 27.00†
Copper wire base	29.25	to 29.75†	29.25	to 29.75†
Lead	6.25		6.30	
Nickel	45.00	to 50.00	45.00	to 50.00
Sheet zinc, f.o.b. smelter	24.00†		25.00†	
Spelter	20.42½	to 20.92½†	20.92½	to 21.17½†
Tin, Straits	42.25		42.25	
Aluminum, 98 to 99 per cent	54.00	to 58.00	56.00	to 58.00

OLD METALS

Heavy copper and wire	21.00	to 23.00†	22.50	to 23.00†
Brass, heavy	14.00	to 14.50†	14.00	to 14.75†
Brass, light	11.50	to 12.00†	12.00	to 12.50†
Lead, heavy	5.00	to 5.25†	5.25	to 5.40†
Zinc, scrap	13.50	to 14.00†	15.00	to 15.50†

COPPER EXPORTS

Total tons to Feb. 21	2,145

†Nominal.

Corporate and Financial

California-Oregon Power Company, San Francisco, Cal.—It has been announced that 90 per cent of the holders of first and refunding bonds have entered into an agreement to waive interest for a period not exceeding five years, and that the securities have also been deposited with a committee which is authorized to enter into a settlement with the company either for cash or stock covering the interest in default. The first coupons to be passed were dated Jan. 1, 1916. There are authorized and outstanding $19,000,000 of common stock, $1,200,000 of divisional bonds and $3,200,000 of general bonds. These latter have also been deposited to secure floating debt in the sum of several hundred thousand dollars. Interest on the divisional bonds and on the floating debt has been paid, and the company, it is stated, is earning nearly enough to pay interest on the general bonds, but as there is a large amount of construction under way and to be completed it was decided to obtain a waiver of interest from the bondholders.

Crawford County Gas & Electric Company, Crestline, Ohio.—The Ohio Public Utilities Commission has authorized the company to sell its property and assets to the Cleveland, Southwestern & Columbus Railway Company, which shall issue in payment therefor two promissory notes of $5,000 each, to bear interest at the rate of 5 per cent per annum and to be secured by a purchase-money mortgage upon the property, maturing May 1, 1918.

Electrical Securities Company, New York, N. Y.—An issue of $1,000,000 of collateral-trust sinking-fund gold 5 per cent bonds, due Feb. 1, 1946, is being offered at 98 and interest.

Middle West Utilities Company, Chicago, Ill.—A block of ten-year 6 per cent collateral gold bonds, due June 1, 1916, is being offered at 96% and interest to net 6.5 per cent. The proceeds of these bonds will be used to reimburse the company's treasury for funds spent in the development of its subsidiary companies.

Nassau Light & Power Company, Mineola, N. Y.—The control of the company has been secured by Hayden, Stone & Company, Boston, Mass., from E. D. Morgan, Harry Payne Whitney, C. H. Mackay, Percy Chubb, Robert Bacon and their associates. Charles Hayden has been elected president of the corporation.

National Carbon Company, Cleveland, Ohio.—The annual report for the year ended Dec. 31, 1915, states that the new plant at Cleveland erected to meet the large demand for storage batteries will be completed within a few months. War conditions have brought a large demand from European countries as well as benefiting the domestic demand by shutting out foreign products, and there was a large increase in shipments to South America. No reference is made to the dividend policy, but the report states that the increase in business has made necessary a larger working capital. The income account compares with the previous year as follows:

	1915	1914
Net income	$2,550,517	$2,215,880
Preferred dividend	392,000	372,750
Common dividend	597,930	582,930
Reserve bonus	25,000	25,000
Reserve insurance	50,000	.....
Depreciation	.....	389,872
Net surplus	1,485,537	825,618
Total surplus	$2,641,443	$1,155,856

Northern States Power Company, Chicago, Ill.—The net earnings of the company for the twelve months ended Dec. 31, 1915, were 18.1 per cent greater than the net for 1914, and the balance applicable for depreciation, common stock, etc., for the year was $771,626. The operating results for the calendar year 1915 were as follows:

Gross earnings	$5,125,998
Expenses, maintenance and taxes	2,255,193
Net earnings	$2,870,805
Fixed charges	1,512,109
Balance	$1,358,696
Preferred stock dividend	587,069
Surplus available for depreciation and common stock dividends, etc.	$771,627

Pacific Gas & Electric Company, San Francisco, Cal.—The income account for the year ended Dec. 31, 1915, shows a gain in gross revenue of over $1,600,000. Expenses increased a little more than $670,000, but at the same time there was a gain in profit from appliance sales and in other miscellaneous income of over $100,000, leaving, therefore, an increase in net income of over $1,000,000. The surplus for the year was greater than for the previous year by almost $1,600,000. After deducting dividends, which had increased by nearly $400,000, the unappropriated surplus for the year showed a gain of $1,181,367. The 1915 and 1914 income accounts of the Pacific Gas & Electric Company are given below:

Gross operating revenue:		
Electric department	$9,924,482	$8,759,449
Gas department	7,560,185	7,015,408
Other departments	1,045,634	1,137,831
Total gross operating revenue	$18,530,301	$16,912,688
Expenses:		
Maintenance	$970,886	$1,052,435
Operating and general	7,157,262	6,905,440
Taxes	849,445	743,047
Reserves for casualties and uncollectible accounts	228,000	213,000
Reserve for depreciation	1,380,000	1,000,000
Total expenses	$10,585,593	$9,913,922
Net earnings from operation	$7,944,708	$6,998,766
Add profits on merchandise sales and other miscellaneous income	413,879	307,816
Total net income	$8,358,587	$7,306,582
Bond interest	3,982,419	3,890,341
Balance	$4,376,168	$3,416,241
Interest on one-year notes and floating debt (temporary)	2,992	301,060
Balance	$4,373,176	$3,115,181
Apportionment bond discount and expense	160,410	147,715
Apportionment note discount and expense (temporary)	.....	321,800
Surplus	$4,212,766	$2,645,666
Dividends:		
First preferred	400,716	14,984
Original preferred	600,000	600,000
Surplus unappropriated	$3,212,050	$2,030,682

Southern Illinois Light & Power Company, Hillsboro, Ill.—The Illinois Public Utilities Commission has approved the company's purchase of the United Gas & Electric Company of Litchfield, Ill. The purchase price is $135,000, to cover which the company will issue $36,000 of its preferred capital stock and $110,000 of its first mortgage 6 per cent gold bonds.

Wagner Electric Manufacturing Company, St. Louis, Mo.—At a special meeting of the stockholders an increase of $200,000 in the capitalization of the company was authorized. Of the increase, $180,000 will be in the form of a stock dividend to present shareholders, amounting to 10 per cent upon $1,800,000 of stock outstanding. The other $20,000 of new stock will be sold at par to department managers. The new stock will give the company a total capitalization of $2,000,000, the majority of which is held by residents of St. Louis. Many small shareholders are among them, although officials are reticent about the total number of stockholders. Wagner Electric has been almost the sole "war bride" among active St. Louis stocks. In January of last year it sold at $125 a share, but it rose gradually in value until June, when it stood at $145 a share. There it remained steady until November, when a further advance of $40 a share was registered. Since that time the upward movement has continued, and the stock changed hands in inter-session sales on the local exchanges at $201. Strength in Wagner Electric shares during the recent weeks has been largely due to rumors that the company will receive additional contracts to manufacture war supplies. While officials will not discuss the nature of the alleged war orders, it was known some time ago that the company had turned out large quantities of brass caps for shrapnel shells. The bulk of the Wagner Electric's orders are understood to be of non-military nature, and 2500 employees are on the payroll—the largest number in the history of the concern.

New Utility and Industrial Companies

The Islands Electric Company of Rockland, Me., has filed articles of incorporation with a capital stock of $100,000 for the purpose of generating and distributing electricity.

The Hillsboro Power & Light Company of Hillsboro, Ill., has been incorporated with a capital stock of $7,500 by S. M. Gattis, H. S. Cates and A. H. Graham, all of Hillsboro.

The Adams Light Company of Butler, Pa., has been granted a charter with a capital stock of $5,000 to operate in Adams Township. The incorporators are R. E. Sprenkle, C. M. Weigle of Butler and C. C. Tennis of Pittsburgh.

The Liberty Electric Company of Liberty, Ill., has been chartered with a capital stock of $2,500 to install and operate an electric-lighting plant in Liberty. The directors are W. E. Mercer, Lawless Klarner, J. Coats and Charles W. Barnard.

The Acme Service Company of Chicago, Ill., has been incorporated by H. D. Moreland, Walter J. Winser and William H. Dellenback. The company is capitalized at $2,500 and purposes to manufacture and deal in electrical and mechanical devices.

The Mendon Electric Light & Power Company of Mendon, Ill., has been incorporated with a capital stock of $5,000 to supply electricity for lamps and motors in Mendon. The incorporators are James A. Thompson, Donald A. Thompson and Minnie G. Thompson.

The Ryder & Graves Electrical Company of Plainfield, N. J., has been chartered with a capital stock of $25,000 to do an electrical and mechanical engineering business. The incorporators are Charles L. Ryder, Jr., George F. Graves of Plainfield, N. J., and Frank Jennings of Jamesburg, N. J.

The Williamson Electric Company of New York, N. Y., has been incorporated by S. B. McNeil, G. S. Hice and L. A. Williamson, 149 West 126th Street, New York, N. Y. The company is capitalized at $150,000 and intends to manufacture and deal in electrical and mechanical devices and machinery.

The Lyon Ventilating Machinery Company of New York has been chartered with a capital stock of $5,000 to manufacture and deal in ventilating, cooling, lighting, refrigerating machinery, foundry supplies, etc. The incorporators are E. Kobbe, W. G. Keil and D. T. Lyon, 788 Riverside Drive, New York, N. Y.

The Domestic Engineering Company of Dayton, Ohio, has been incorporated with a capital stock of $800,000 to take over the Delco light business of the Dayton Engineering Laboratories Company. The plant will be installed in a new industrial center being developed south of Oakwood, near Dayton. The company will manufacture electric-lighting outfits for farms and rural communities. The incorporators are Edward A. Deeds, R. H. Grant, R. D. Funkhouser, F. E. McNabb and B. F. McCann.

The Electric Heating & Manufacturing Company of Seattle, Wash., has been incorporated with a capital stock of $75,000 for the purpose of manufacturing "Apfel's system of electric heating" and other patented electrical specialties. The company has purchased the factory building at 1812 Ninth Avenue, South, Seattle. J. G. Eddy of Everett is president and P. F. Apfel is secretary and treasurer. The offices of the company are at 418 Union Street, Seattle.

Trade Publications

Electric Air Compressors.—The United States Air Compressor Company, Cleveland, Ohio, has prepared Catalog No. 15, descriptive of its electrically operated two-stage air compressors.

Electric Ranges.—The Globe Stove & Range Company, Kokomo, Ind., is distributing five leaflets which describe, illustrate and give concise data on the "B" series of Globe electric ranges.

Tungsten Mining in Colorado.—The Vanadium-Alloys Steel Company, Pittsburgh, Pa., has prepared reprints of an article by R. C. McKenna, president of the company, on "Tungsten Mining in Colorado."

Electrically Operated Ranges.—The Estate Stove Company, Hamilton, Ohio, has issued an attractively illustrated catalog, designated as No. 10, on its recently developed electric ranges and electric heaters.

Electric Washers.—The Wayne Manufacturing Company, St. Louis, Mo., has just published an illustrated folder printed in colors, descriptive of several types of its electrically operated washing machines.

Storage-Battery Parts.—The second edition of Catalog Section B has been issued by the Electric Storage Battery Company, Philadelphia, Pa., and illustrates various parts and supplies for use with several of its batteries.

Tungsten.—Carlisle & Company, 74 Broadway, New York, have prepared a booklet entitled "Tungsten, Its Properties and Uses." The book is very complete and contains extracts from the Geological Survey reports.

Small Motors.—The Robbins & Myers Company, Springfield, Ohio, is sending out a folder which contains information on the scope of the company's advertising in various magazines concerning its small motors for driving various kinds of apparatus.

Wire and Insulating Materials.—The D & W Fuse Company, Providence, R. I., has just issued a catalog descriptive of its Deltabeston wires and insulating materials. With the exception of the "Deltabeston" magnet wire, the various kinds of wire described are of recent development.

Storage Batteries.—The Cook Railway Signal Company, Denver, Col., has issued Catalog No. 2, on its new and improved electric storage batteries for lighting and ignition service, and Bulletin No. 2-B and Catalog No. 3, on its electric-lighting plants, which are equipped with "ReVivo" storage batteries.

How to Figure Illumination.—The sixth edition of a handbook entitled "How to Figure Illumination" has been issued by the Western Electric Company, 463 West Street, New York. The booklet lists complete tables of various types of "Sunbeam Mazda" lamps and illustrates and describes them, giving complete characteristics.

Electric Equipment.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has published Leaflet No. 3832, on its No. 307-CV railway motor; Leaflet No. 3504-A, on the selection of type CI alternating-current motors for intermittent service; Leaflet No. 3513-A, on machine-tool controllers for direct-current motors; Leaflet No. 3834, on its No. 306-CV railway motor; Leaflet No. 3766-A, on its large slip-ring type CW induction motors; Leaflet No. 3836, on its No. 548-A railway motors, and Leaflet No. 3848, on its types B and R rheostatic drum controllers.

New England

HOULTON, ME.—The Houlton Mills & Lt. Co. expects to install 40 or 50 new meters. T. C. S. Berry is proprietor.

CONCORD, N. H.—The Concord El. Co. is contemplating extending its service, covering about a mile of new territory. Eventually the company will extend its transmission lines to Penacook.

CONCORD, N. H.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until March 1 for furnishing and installing lighting fixtures in the United States post office at Concord, N. H. For details see proposal columns.

BELMONT, MASS.—During the coming year the electric-light department will purchase pole-line material, including meters, transformers, etc., for ordinary extensions to its present distributing system, to cost approximately from $4,000 to $5,000. E. P. Taylor, 445 Trapelo Road, Waverly, Mass., is manager of the municipal electric light department.

LONGMEADOW, MASS. — The town lighting committee has recommended the discarding of the gas lamps now in use and the installation of about 200 incandescent electric lamps of about 100 cp. The United El. Lt. Co. of Springfield furnishes electrical service in Longmeadow.

MILFORD, MASS.—The Milford El. Lt. & Pwr. Co. has applied to the Board of Gas and Electric Light Commissioners for permission to erect a transmission line from Milford to Hopedale for the purpose of supplying electricity in Milford and Hopedale to be furnished by the Connecticut River Transmission Co.

SALEM, MASS.—The Eastern Massachusetts El. Co., recently organized for the purpose of connecting up the Salem El. Lt. Co., Salem, the Malden & Melrose El. Co., Melrose, and the Suburban Gas & El. Co., Revere, all of which are controlled by the Tenney interests, has applied to the State Gas and Electric Light Commissioners for authority to issue capital stock to the amount of $250,000. The company, it is understood, contemplates a large development at the plant of the Salem El. Lt. Co. in Salem.

SPRINGFIELD, MASS.—Plans are being prepared by McClintock & Craig, architects, Springfield, for a large extension to the electric plant of the United El. Lt. Co. at the foot of State Street. The plans, it is understood, provide for the installation of a 20,000-kw. turbo-generator, 12 boilers of 700 hp. each, equipped with automatic stokers, etc.

TURNERS FALLS, MASS.—The Turners Falls Pwr. & El. Co. will soon start work on the erection of an electric transmission line from Turners Falls to Amherst, a distance of 25 miles.

NEW BRITAIN, CONN.—The United El. Lt. & Wtr. Co. is erecting about 5 miles of 11,000-volt distribution lines from the Housatonic Pwr. Co.'s power station in New Britain to the brick yards in Berlin. It is proposed to supply all the large power customers in New Britain from this line. A transformer station will be built in New Britain to step current down to 2300 volts to supply smaller power customers. The 11,000-volt circuits will be in duplicate from the substation of the Housatonic Pwr. Co. to the United El. Lt. & Wtr. Co.'s substation. George F. Atwater is superintendent.

Middle Atlantic

ALBANY, N. Y.—Bids will be received by the trustees of public buildings, Executive Chambers, Capitol, Albany, until March 9 for electric elevators in connection with the alterations and additions to the State House. Drawings and specifications may be consulted at the New York office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher, Capitol, Albany, is State architect.

BUFFALO, N. Y.—Plans are being prepared, it is reported, by the International Ry. Co., Buffalo, for increasing its power system by 3000 kw. at a cost of about $175,000. The present plans provide for the installation of additional equipment in five substations, including seven 1000-kw. rotary converters. Energy will be transmitted to these stations from Niagara Falls.

DUNKIRK, N. Y.—Application has been made to the City Council by the Niagara & Erie Pwr. Co., Fredonia, for a franchise to supply energy in Dunkirk. The company wishes to furnish electricity to the Atlas Crucible Steel Co.

KINGS PARK, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until March 3, for construction, including heating, plumbing and drainage, and electric work, for employees' home at the Kings Park State Hospital, Kings Park. Drawings and specifications may be consulted at the Kings Park Hospital, at the New York office of the Department of Architecture, Room 1224, Woolworth Building, New York, and at the Department of Architecture, Capitol, Albany. Drawings, specifications and blank forms of proposal may be obtained at the Department of Architecture, Capitol, Albany, upon a deposit of $10 for each set of plans. E. S. Ellwood is secretary of State hospital commission.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

ONEONTA, N. Y.—The Oneonta Lt. & Pwr. Co. has applied to the Public Service Commission for authority to issue $65,000 in capital stock. Application has also been made by the company for permission to operate an electric-light, heat and power system in that part of the town known as the Junction, and also in the section of the town known as the Hamlet in West Oneonta.

PORTLAND, N. Y.—The Niagara & Lake Erie Pwr. Co., Fredonia, is planning to extend its transmission lines to Portland to supply electrical service here.

HOKENDAUQUA, PA.—The Commissioners of Whitehall Township have appropriated $5,410 for the purpose of illuminating Mickley's Pike for the entire length.

HOLTWOOD, PA.—Plans are being considered by the Pennsylvania Wtr. & Pwr. Co., Holtwood, for increasing the output of its hydroelectric generating plant during 1916. The office of the engineering department is in the United States Fidelity & Guaranty Building, Baltimore, Md.

LANCASTER, PA.—The contract for electric wiring for the new Boys' High School in Lancaster has been awarded to Joseph S. Miller & Co., Philadelphia, at $5,890.

LEBANON, PA.—The Edison El. Illg. Co. of Lebanon is erecting a transmission line (approximately 15 miles long) to supply electricity to a newly organized company which will supply electrical service to three small towns.

MILLVALE, PA—New equipment has recently been purchased for the municipal electric-light plant, including a 500-kw. Westinghouse turbo-generator, one surface condenser, one economizer and two 200-hp. Keeler water-tube boilers. James Grundy is superintendent.

NICHOLSON, PA.—The Nicholson Lt., Ht. & Pwr. Co. is planning to extend its transmission lines to Hop Bottom this spring to furnish electrical service there. William S. Decker is assistant manager.

PHILADELPHIA, PA.—Bids will soon be asked for the construction of a new power house for Rafleigh & Co., to be erected at American and Somerset Streets, Philadelphia. W. E. Dyer, Philadephia, is engineer in charge.

PHILADELPHIA, PA.—Plans are being prepared for the construction of a five-story reinforced and concrete and brick building for the Splitdorf Elecl. Co. in Philadelphia. Monks & Johnson, 78 Devonshire Street, Boston, Mass., are architects.

ST. MARY'S, PA.—The St. Mary's El. Lt. Co. will obtain electricity from the new central power station of the Ridgway El. Lt. Co., Ridgway, when completed (probably about June 1) to operate its system. The local plant will be dismantled and substation equipment installed. W. H. Hetznecker, Jr., is superintendent.

TITUSVILLE, PA.—The city of Titusville is contemplating the installation of an ornamental lighting system in the business district, the merchants to purchase the standards and equipment and the city to furnish electricity to maintain the lamps. Fred C. Johnson is superintendent of the municipal electric plant.

FRENCHTOWN, N. J.—Plans are being made for the installation of a 15-kw. transformer in the municipal electric-light plant.

MILLBURN, N. J.—The Millburn El. Co. is changing its plant from 125 cycles to 60 cycles, single, 110/220 volts, and is installing two directly connected units, 400 kw. each, General Electric generators and compound Buckeye engines, 18 in. by 36 in. by 30 in.; also one 200-kw. General Electric generator belted to a 19-in. by 18-in. Ball simple engine. Alterations are not completed, and there are yet to be installed two 250-hp. Babcock & Wilcox boilers and a 130-ft. smokestack to be erected. W. R. Wittingham is president.

DOVER, DEL.—The Eastern Pennsylvania Pwr. Co. of New Jersey, it is reported, contemplates the construction of a new power plant in Dover, to cost about $200,000. The company has recently leased the power plant of the Morris County Trac. Co. in Dover.

CUMBERLAND, MD.—At an election to be held March 21 the proposal to issue $20,000 in bonds for the installation of an electric-lighting plant will be submitted to the voters.

BALTIMORE, MD.—Preliminary plans have been prepared by the Baltimore Sheet & Tinplate Co. for the construction of a tin-plate plant with an annual capacity of 100,000,000 lb., to be situated on the water front. Equipment to include twelve hot mills, with intermediate and finishing departments, including assorting and shipping rooms. The plant will be driven by electrical power, requiring from 3000 hp. to 3500 hp. The company is capitalized at $5,000,000. J. M. Jones, vice-president and general manager of the Massillon Rolling Mills Co., Massillon, Ohio, is president and general manager of the Baltimore Sheet & Tinplate Co.

PETERSBURG, VA.—Arrangements have been made by the Greater Petersburg Development Corpn. for the development of Riverside Park as a suburb. Improvements involving an expenditure of $75,000 will be made and will include the installation of an ornamental street-lighting system.

STUART, VA.—The Council has granted W. H. Clark a franchise to supply electricity for lamps and motors in Stuart. Mr. Clark is planning to develop a water-power site on Mayo River.

North Central

DETROIT, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until March 17 for furniture, lighting, lighting fixtures, etc., in the United States post office and court house in Detroit, Mich. For details see proposal columns.

EAST TAWAS, MICH.—The citizens have voted to sell the municipal electric-light plant to the Consumers' Pwr. Co., Owosso; also to grant the company a 30-year franchise in East Tawas.

EDMORE, MICH.—Preparations, it is stated, are being made by W. C. Clark, Pontiac, who recently purchased the local electric-light plant, for the development of a hydroelectric plant to supply electricity in Edmore. Water-power rights at Riverdale and Sumner, 10 miles east on Pine River, have been purchased by Mr. Clark, and it is proposed to erect a plant there.

IONIA, MICH.—Plans are being prepared by Wernette, Bradfield & Mead, architects, Grand Rapids, for a 1000-hp. power plant for the Ypsilanti Reed Furniture Co., to cost about $20,000.

WEST BRANCH, MICH.—The Northern Pwr. Co., which has acquired the property of the Rifle River El. Lt. Co. in West Branch, has applied for a new franchise. If granted, the company promises to make improvements to the plant and service. J. R. Thorne is general manager.

AKRON, OHIO.—The Northern Ohio Trac. & Lt. Co., Akron, has applied to the Public Utilities Commission for permission to issue $518,400, the proceeds to be used for extensions to its generating capacity and for additions and betterments to its properties.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, 511 City Hall, Cleveland, until March 2 for 16-in. glass globes for the street-lighting division. Specifications may be obtained in the office of the superintendent of lighting, 413 Superior Avenue, City Hall.

COLUMBUS, OHIO.—The Columbus Ry., Lt. & Pwr. Co. has signed contracts with the residents on the State Road south from Minerva Park to Westerville to furnish electricity. A special line will be erected to supply the service.

COLUMBUS, OHIO.—The City Council has passed an ordinance providing for an issue of $265,000 in bonds for extensions and improvements to the municipal electric-light plant and distribution system, including the installation of new equipment. The placing of wires underground in considerable territory is under consideration.

DUNKIRK, OHIO—The installation of a municipal electric-lighting plant in Dunkirk is under consideration.

HICKSVILLE, OHIO.—The Hicksville El. Lt., Ht. & Pwr. Co. is contemplating extending its transmission lines to Ney to furnish

electrical service there. Negotiations are under way between the City Council and the company relative to replacing the present arc-lamp street-lighting with either cluster lamps or single lamps erected on standards. C. M. Lott is president and manager.

MASSILLON, OHIO.—Two new boilers and an 8000-hp. steam turbo-generator set are being installed at the plant of the Massillon El. & Gas Co.

ST. MARY'S, OHIO.—The Council has engaged Fred Froelich, Second National Bank Building, Toledo, to make investigations of the municipal electric-light plant and water-works system relative to rebuilding.

GLASGOW, KY.—The capital stock of the Glasgow El. Lt. & Ice Co. has been increased from $50,000 to $75,000.

HARTFORD, KY.—The Kentucky Lt. & Pwr. Co. is contemplating extensions to its plant in Hartford.

WHITESBURG, KY.—The installation of an electric-light plant, water-works and other public utilities in Whitesburg is under consideration. J. J. Bell, Lexington, is interested.

ANDERSON, IND.—Extensive improvements are under way at the municipal electric-light plant, which will include the installation of two 500-hp. boilers, one 3000-kw. generator, coal and ash-handling equipment and a cement smokestack.

HILLSBORO, IND.—Plans are being considered, it is reported, by local business men for raising the dam in the creek 5 ft. to develop power for an electric power plant.

INDIANAPOLIS, IND. — Arrangements are being made by the Indianapolis Lt. & Ht. Co. for the installation of a new power plant on the site of its present plant on Kentucky Avenue, to cost about $4,000,000.

INDIANAPOLIS, IND.—The Indianapolis & Cincinnati Trac. Co., Indianapolis, is contemplating extending its railway from Rushville to Cincinnati, a distance of 62 miles. The city of Cincinnati will vote in April on a proposal to issue $6,000,000 in bonds for the construction of a 15-mile terminal loop.

CARLINVILLE, ILL. — The Madison County Lt. & Pwr. Co. is changing a 26-mile, 17,000-volt, 60-cycle, three-phase installation to 33,000 volts, three-phase, 60 cycles, including all transformers, lightning arresters and substation equipment; the present installed line construction is being used. E. D. Bell is general superintendent.

DIXON, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, until March 14 for the construction of two kitchen buildings and refrigerating equipment at the State Colony for Epileptics, 3 miles from Dixon. Separate bids to be submitted for general work, heating equipment, electric wiring, plumbing and refrigerating equipment. Plans and specifications may be obtained upon application to James B. Dibelka, State architect. 130 North Fifth Avenue, Chicago.

GALENA, ILL.—Preparations are being made by the Interstate Lt. & Pwr. Co., Galena, it is reported, to furnish energy to the United Steel Co. for its mines near Schulesburg, and additional power to the mine of the Cleveland Mining Co., near Galena. To furnish this additional service it will be necessary for the company to increase the generating capacity of the Galena station for which arrangements are now being made.

SIBLEY, ILL.—At an election held recently the proposal to issue bonds for the installation of a municipal electric-lighting plant was carried.

WARREN, ILL.—The installation of a larger generating unit in the very near future is contemplated by the Warren Lt. & Pwr. Co. Negotiations are now under way between the company and the towns of Gratiot and South Wayne, Wis., for electrical service. This extension will involve the erection of 5 miles of three-phase, 13,200-volt transmission line and 7 miles of single-phase lines. G. W. S. Scheidecker is president and general manager.

FARIBAULT, MINN.—Plans have been completed for the installation of a 1000-kw. turbo-generator unit at the Cannon Falls hydroelectric plant of the Northern State Pwr. Co., increasing the capacity to 2100 kw.

MINNEAPOLIS, MINN.—Bids will be received by the board of education of the city of Minneapolis until March 13 for the construction of additions and alterations of the West High School, including foundations, general work, plumbing, heating and ventilating, temperature regulation, electric work and clocks, bells and telephones. Specifications are on file at the office of the board of education, Minneapolis, and at the office of William B. Ittner, architect, 408 Board of Education Building, St. Louis, Mo.

NEW ULM, MINN.—Bids will be received at the office of William Backer, city clerk, New Ulm, until March 7 for furnishing and installing one belted deep-well pump; discharge to be 225 gal. per minute, against 80 lb. pressure (depth of well 180 ft., 7¾ in. working barrel) with electric motor, starting apparatus and switch complete. Plans and specifications may be obtained upon application to F. D. Minium, city engineer, New Ulm.

PRESTON, MINN.—The Root River Pwr. & Lt. Co. is reported to be contemplating the construction of an auxiliary plant in Preston, to cost about $25,000.

WINONA, MINN.—Preparations are being made by the Wisconsin Ry., Lt. & Pwr. Co., La Crosse, Wis., it is reported, for the construction of a new steam-driven reserve power plant (to cost about $20,000), work on which will soon begin.

ARCHER, IOWA.—The installation of an electric-light plant in Archer is under consideration.

AUDUBON, IOWA.—The Federal Lt. & Pwr. Co. has purchased the property of the Audubon County El. Co., which furnishes electrical service in the towns of Audubon, Exira and Hamlin. The Federal company, it is understood, will build a new plant in Audubon and extend the transmission lines to Manning, which plant it recently purchased. The company will supply electrical service to the towns of Ross and Gray, to which the proposed line will pass.

CAMBRIDGE, IOWA.—W. A. Curtis, owner of the local electric-light plant, expects to purchase two 10-kw., 6600/220-volt transformers and 4 miles of No. 6 wire.

CANTRIL, IOWA.—The Cantril Tel. & El. Lt. Co. is contemplating the installation of 50-hp. to 75-hp. oil engine. The company would consider a second-hand engine, Meitz & Weiss preferred. George W. Irvin is manager.

DENISON, IOWA.—The City Council is considering extending the transmission lines of the municipal electric-light plant to Arion and Vail to supply electrical service in those towns. It is also proposed to furnish electricity to residents along the proposed line.

DES MOINES, IOWA.—Bids will be received by Proudfoot, Bird & Rawson, Hubbell Building, Des Moines, until March 8 for construction of a 12-story and basement building (to cost about $250,000) for the *Register and Tribune*, to be erected at Seventh and Locust Streets, Des Moines. Separate bids to be submitted on electric wiring, steam heating and plumbing. Plans provide for two passenger and one electric elevator, automatic sprinkler, vacuum cleaner, Lowerator pneumatic-tube system, etc.

IOWA FALLS, IOWA.—The Iowa Falls El. Co. has been granted franchises in the towns of Alexander and Coulter to supply electricity for commercial purposes.

ORIENT, IOWA—At an election held recently the proposal to issue $10,000 in bonds for the installation of a municipal electric-light plant was carried.

WAUKEE, IOWA.—Bonds to the amount of $7,000 have been issued for the installation of an electric-lighting system in Waukee. Energy to operate the proposed system will be obtained from the Adel (Iowa) Lt. & Pwr. Co.

WAUKON, IOWA.—The City Council is considering the question of installing an electric-light plant, to cost about $7,000.

GORIN, MO.—Improvements are contemplated to the local electric light and mill plant, owned by Piles & Brown, including the installation of a steam boiler, engine and generators.

KANSAS CITY, MO.—An extensive water-power development along the Osage River in western Missouri is being promoted by men who have acquired large areas of land along the river. A bill has been introduced by Representative Hamlin in the House of Representatives authorizing the National Investment & Development Co. of Warsaw and Kansas City to construct a dam and power plant on the Osage River in Benton County. The company, it is understood, proposes to supply electricity in Kansas City and vicinity.

MEMPHIS, MO.—At an election to be held Feb. 28 the proposal to issue $25,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters.

OREGON, MO.—The St. Joseph Transmission Co., recently organized, is reported to be contemplating a 1000-hp. development and the erection of a transmission line from Oregon to St. Joseph, a distance of 50 miles, to supply electricity to towns between the two cities named. Morton R. Martin is general manager.

PIERCE CITY, MO.—The Ozark Pwr. & Wtr. Co., Branson, has applied for a franchise to furnish electricity here. The company proposes to extend its transmission system from Powersite to Pierce City.

ST. CHARLES, MO.—The American Lt. & Pwr. Co., St. Charles, is contemplating extending its transmission lines to Wentville and Wright City. F. E. Murray is local manager.

ST. LOUIS, MO.—An appropriation will be asked by the aldermanic committee to employ electrical engineers to make a survey of the city preparatory to submitting a report on a municipal electric-lighting proposal.

HURLEY, S. D.—Bonds to the amount of $10,000 have been voted for the purchase of the local electric-light plant.

NORTH PLATTE, NEB.—Bids will be received by the Board of Education, North Platte, until March 13 for the construction of a junior-high-school building (66 ft. by 169 ft., three stories high). Separate bids will be received for the installation of heating and plumbing, electric wiring and vacuum-cleaning system for building. Plans and specifications may be obtained at the office of B. M. Reynolds, architect, North Platte, upon deposit of $10.

COUNCIL GROVE, KAN.—The Council Grove Ice, Lt. & Pwr. Co. is contemplating the erection of about 6 miles of transmission line to supply electrical service to farmers. G. W. Harlan is president and manager.

EDNA, KAN.—Application has been made to the Council by C. E. Page for a franchise to supply electricity in Edna.

ELLIS, KAN.—The Municipal Light and Water Department is contemplating the installation of an additional electric generating unit, consisting of a 60-hp. steam engine and a 100-kw., three-phase, 2300-volt alternator and exciter; also extension to steam-heating system of 12,000 ft. radiation. Ray C. Hall is superintendent.

EMPORIA, KAN.—Bids will be received until March 3 for electric wiring for the Preston B. Plumb Memorial Building at the State Normal School. Edward T. Hackney is president and Charles H. Chandler, Topeka, is architect.

EUDORA, KAN.—At an election to be held March 8 the proposal to issue $10,000 in bonds for the installation of an electric-light system will be submitted to the voters.

GARDEN CITY, KAN.—The Garden City Sugar Co. is contemplating the installation of a 1000-kw. electric generating unit in its power plant.

GARNETT, KAN.—A 110-kva. electric generating unit and a 150-hp. boiler have recently been installed in the municipal electric-light plant. C. B. DeTar is superintendent of water and light department.

HAYS, KAN.—Bids will be received by Lee Harrison, secretary Board of Administration of Educational Institutions, State House, Topeka, until March 10 for construction of auditorium and gymnasium building, including electric wiring, steam heating, plumbing, etc., at Hays, to cost about $100,000.

HOLTON, KAN.—The erection of a transmission line, 23 miles long, is contemplated by the municipal electric-light and water-works department, for which material will be needed as follows: 50-kw., 2300/13,200-volt step-up transformer, lightning arresters, recording watt-hour meter, switchboard panel, oil switch, etc.; also pole-type substation, 10-kw., 13,200/110/220-volt step-down transformer, disconnecting switches, etc.

HOXIE, KAN.—The installation of a municipal electric-lighting plant in Hoxie is reported to be under consideration.

HUMBOLDT, KAN.—The installation of an additional waterwheel and generator is under consideration by the Humboldt Mill & Pwr. Co. W. P. McGrew is manager.

ISABEL, KAN.—Larabee & Sons, owners of the local electric-light plant, contemplate the installation of a 100-hp. engine.

KANSAS CITY, KAN.—The City Commissioners have decided to purchase a 3000-kw. generator for the municipal electric-lighting plant, increasing the output to 12,000 kw.

KANSAS CITY, KAN.—Plans are being prepared, it is reported, by the Leonard Construction Co., McCormick Building, Chicago, Ill., for the construction of a large building in Twenty-fifth Street, between McGee and Grand Streets, to cost about $500,000. S. W. Ramsey, 2110 Grand Avenue, Kansas City, is local manager.

KIOWA, KAN.—Bids will be received by the city of Kiowa at the office of the city clerk, Kiowa, until March 7 for extensions and improvements to water-works system and the installation of an additional generating unit at the electric-light plant, including one 250-hp. oil engine complete and one 175-kw. alternating-current generator (di-

rectly connected). Plans and specifications are on file at the office of the city clerk.

LA HARPE, KAN.—Application has been made by James MacDonald to the Council for a franchise to supply electricity in La Harpe for lamps and motors.

MEADE, KAN.—The Meade Lt. & Pwr. Co. is considering the installation of a 12½-kva., 60-cycle, three-phase generator and a 15-hp. oil engine, and also a 20-kva. generator, same as above, with a 25-hp. oil engine, both to be synchronized with a 37½-kva. generator. The company will soon establish a 24-hour service and will need electrical appliances, including irons, fans and motors.

NORCATUR, KAN.—The City Council is contemplating the installation of a distributing system in Norcatur. Energy may be secured from either the Norton or the Oberlin plant.

PERRY, KAN.—Improvements are contemplated to the municipal electric-light plant, including an addition to station building (20 ft. by 36 ft.), the installation of a 50-hp. engine directly connected to a 35-kw. direct-current generator and 40 new meters. F. W. Bettys is superintendent.

Southern States

DURHAM, N. C.—The installation of a 300-kva. rotary converter and additional feeder switchboard is contemplated by the Durham Trac. Co. C. S. Reed is secretary.

KERNERSVILLE, N. C.—The installation of a municipal electric-lighting plant at Kernersville is under consideration.

SHELBY, N. C.—The City Council is contemplating the installation of an ornamental street-lighting system at a cost of about $3,000.

WARSAW, N. C.—The town of Warsaw, it is reported, is prepared to grant a franchise for the installation and operation of an electric-lighting system.

McRAE, GA.—The city of McRae has awarded the Singleton-Smith Co., electrical engineers, a contract for the installation of pumping station, complete, consisting of a brick fireproof power house, two 70-hp. Muncie crude-oil engines, a Gould two-stage, motor-driven centrifugal pump having a capacity of 500 gal. per minute, and an 8000-gal. fuel-oil storage tank.

RUTLEDGE, GA.—The Dysard El. Pwr. Co. has submitted a proposal offering to supply electrical service in Rutledge.

MELBOURNE, FLA.—The Peninsular Engineering & El. Co., St. Petersburg, will install an electric-lighting plant and ice factory at Melbourne. The company would like to receive prices on a second-hand 50-hp. or 60-hp. oil engine and a 37½-kva., single-phase or three-phase, 60-cycle, 2300-volt generator with exciter and switchboard.

PENSACOLA, FLA.—The City Council is contemplating the installation of a generator to supply electricity for lighting the water-works plant.

PENSACOLA, FLA.—A bill has been passed by the United States Senate authorizing George H. Hervey to construct and operate an electric railway on the military reservation at Fort Barrancas and Fort McRae.

SOUTH JACKSONVILLE, FLA.—The Board of Bond Trustees is considering the installation of a 175-kw., 60-cycle, 2300-volt generating unit (directly connected). T. A. Murwin is superintendent.

CALHOUN, TENN.—The Hiawassee Lt. & Pwr. Co., Charleston, is planning to supply electricity in Charleston and Calhoun. The company will secure energy from the Tennessee Lt. & Pwr. Co. to operate its proposed system.

CHATTANOOGA, TENN.—Plans have been prepared by W. H. Sears, Chattanooga, for extensions to the Davis Hosiery Mills, to cost about $150,000. The work will include construction of additional buildings, addition to knitting mill and power plant.

MARYVILLE, TENN.—The Dreamland Amusement Co. is reported to be in the market for a 15-kw. direct-current generator directly connected to a kerosene-oil engine.

NASHVILLE, TENN.—Plans are being prepared by the Cumberland Tel. & Teleg. Co. for the construction of a central exchange and office building (to cost $200,000) to replace the building damaged in a recent fire. A new switchboard and wiring system will be included in the work.

RIDGEVILLE, TENN.—Preparations are being made by the Standard Processing Co., Ridgeville, for extensions to plant, to cost about $11,000. Additional machinery (electrically driven) will be installed, at a cost of $15,000.

RUSKIN, TENN.—Plans are being considered, it is reported, for rebuilding the electric-power plant at Ruskin Cave College, recently destroyed by fire, causing a loss of from $10,000 to $15,000.

BIRMINGHAM, ALA.—Plans for the installation of a new generating unit in the power plant of the Alabama Pwr. Co. at Lock 12 and the extension of the tower transmission line of the company into north Alabama to make a loop through Decatur and Huntsville, and for an electric furnace at Anniston, are reported to be under consideration. The company is now erecting a transmission line from Decatur to Hartselle and is also building a substation at the latter place.

HURTSBORO, ALA.—Bonds to the amount of $9,000 have been voted for extensions to the electric-light plant and water-works system.

GURDON, ARK.—The town of Gurdon has granted Richard Swartz, Hot Springs, a 25-year franchise to construct and operate an electric light and power plant. Work on construction of the plant will begin at once. Two generating units of unequal size will be installed, belted and driven by fuel-oil engines.

MALVERN, ARK.—Bids will be received by the Commissioners of Water Works, Improvement District No. 10, Sewer Improvement District No. 11, Malvern, until March 1, for furnishing all material for water-works and sewerage systems, including brick, stone, reinforcing steel, galvanized pipe and fittings, fire hydrants, gate valves and boxes, etc.; also 88 cypress or chestnut poles (33 ft. long), 33,300 ft. No. 6 hard-drawn, bare copper wire, one 100,000-gal. tank on 75-ft. tower, one 500-gal. motor-driven pump, two 500-gal. motor-driven service pumps, two 500-gal. motor-driven vertical centrifugal pumps, and one 6-in. filter manifold system. Specifications may be obtained from the J. B. McCrary Co., Little Rock, Ark., and Atlanta, Ga.

JENNINGS, LA.—The Jennings Gas & El. Co. is contemplating the purchase of a 150-hp. to 200-hp. oil engine or a 150-hp. to 200-hp. "Unaflow" steam engine. F. M. Litten is manager.

KENTWOOD, LA.—E. B. Kennon, owner of the local electric-light plant, is contemplating (not just at present) the installation of a new boiler (66 in. by 18 in. or 16 in.) and two new gasoline or oil engines, one from 15 hp. to 20 hp. and the other from 4 hp. to 5 hp.

LEESVILLE, LA.—The Leesville Lt. & Wtr. Wks. is contemplating the installation of a new generating unit, consisting of a 120-kw., 60-cycle, three-phase, 2300-volt generator and engine (directly connected), to furnish electricity for lighting purposes. W. K. Ferguson is superintendent.

MANSFIELD, LA.—The Mansfield Ice Co. has opened up a new office and will carry a line of electrical goods. The company has been awarded the contract for electric wiring and telephone system for the new building for the Bank of Commerce. The cost of the building is estimated at $35,000. D. G. Petty is manager.

ARDMORE, OKLA.—Surveys have been made on the Washita River, 14 miles from here, for the city of Ardmore, with a view of establishing a hydroelectric power plant and the erection of a transmission line to city. The cost is estimated at $375,000.

JONES, OKLA.—Bids will be received by the Board of Town Trustees until March 10 (readvertisement) for the installation of a water-works system and electric-lighting plant, including laying of water mains, fire hydrants, valves and boxes, elevated tank, one deep well, electric distributing system, including poles, street lamps, etc.; power house and generating machinery, etc. The cost of the work is estimated at about $10,000. Specifications may be obtained of the Benham Engineering Co., Colcord Building, Oklahoma City, upon deposit of $5.

RINGLING, OKLA.—Application has been made to the city of Ringling by J. Hamon for a franchise for the installation of an electric-lighting plant here.

WISTER, OKLA.—Bonds to the amount of $7,000 have been authorized by the Board of Trustees for the installation of an electric-lighting system.

BARTLETT, TEX.—The Texas Pwr. & Lt. Co., Dallas, it is understood, will rebuild its local substation, recently destroyed by fire, causing a loss of about $5,000.

BENJAMIN, TEX.—The installation of an electric-light plant in Benjamin is under consideration. J. C. Copeland is reported to be interested in the project.

CLAUDE, TEX.—The contract for installation of the municipal electric-light plant has been awarded to Nelson & Smalley, Claude.

EDNA, TEX.—The Edna Ice & Lt. Co. has recently installed a crude-oil engine, Fairbanks, Morse Co., type Y. R. Linnartz is manager.

FLOYDADA, TEX.—Steps have been taken by the Chamber of Commerce to secure the installation of an electric-lighting plant in Floydada.

GOLDTHWAITE, TEX.—The Goldthwaite Lt. & Ice Co. is installing a 20-hp. automatic steam engine. Edward Geeslin is vice-president and manager.

HEDLEY, TEX.—The Texas Southern El. Co. is considering the establishment of an electric-light plant or the erection of a transmission line to Hedley. For further information address A. L. Chase, manager, Clarendon, Tex.

HEREFORD, TEX.—The city of Hereford is considering the construction of a municipal electric-light plant. Plans for the initial installation, it is understood, provide for two turbine-engine-driven units (directly connected) having a rating of 250 hp. each.

KERRVILLE, TEX. — The Kerrville El. Lt., Ht. & Pwr. Co. is installing a new Fairbanks-Morse crude-oil engine T. Holdsworth is manager.

MEMPHIS, TEX.—The Texas Southern El. Co., it is reported, contemplates improvements to its local system.

OZONA, TEX.—The Ozona Improvement Co. is planning to install a new ice-making machine and a new deep-well pump. The cost of the proposed improvements is estimated at $1,500. Frank F. Friend is manager.

PLAINVIEW, TEX.—The Texas Utilities Co., it is reported, contemplates extensions to its street-lighting system in Plainview.

Pacific States

COUPEVILLE, WASH.—The Whidby Island El. & Pwr. Co., Langley, has recently acquired an option on the local electric-light plant. If the plant is taken over by the company, it is understood that some improvements will be made to the system.

OAK HARBOR, WASH.—The City Council has granted the Whidby Island El. & Pwr. Co., Langley, a franchise to install an electric-light plant and water-works system in Oak Harbor for a period of 25 years.

PASCO, WASH.—Plans have been approved by the officials of the Pacific Pwr. & Lt. Co., Portland, Ore., for expensive improvements to its system at Sunnyside and along the electric transmission line between Spokane and Pasco.

PORTERVILLE, CAL.—Plans are being prepared for the construction of a new substation for the Mount Whitney Pwr. & El. Co. in Porterville.

TWIN FALLS, IDAHO.—The Great Shoshone & Twin Falls Wtr. Pwr. Co., Twin Falls, contemplates rebuilding its distribution lines, owing to the consolidation of the properties of the Electric Investing Co.; also connection of primary lines between two companies. The company is also contemplating a campaign on electric ranges.

FLORENCE, ARIZ.—At an election to be held March 11 the proposal to issue $50,000 in bonds for the installation of a municipal electric-light plant and water-works system will be submitted to the voters.

LAMBERT, MONT.—A committee has been appointed to make investigations to determine the cost of installing a municipal electric-light plant and water-works system in Lambert.

BOULDER, COL. — Extensive improvements are contemplated by the Western Lt. & Pwr. Co., Boulder, to its plants, involving an expenditure of about $140,000.

DENVER, COL.—Work is now under way for extensive improvements to the lighting system of the Denver Gas & El. Lt. Co., which will involve an expenditure of about $160,000. The plans provide for a three-phase, four-wire, grounded-neutral, 4000-volt system, replacing the single-phase, 2000-volt system now in use. New equipment, including switchboard, is being installed at the West Side and Lacombe Stations.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until March 8 for tire steel, cable clips, brass tubing, pulleys, asbestos gaskets, etc. Blanks and general information relating to this circular (No. 1017) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

1,171,405. Liquid-Level Electrical Indicator; Dave Ablon, Dallas, Tex. App. filed Feb. 26, 1915. Light gradually increases in brightness as liquid lowers in tank.

1,171,415. Selecting System; O. A. Danielson, New York, N. Y. App. filed March 20, 1914. Particularly for printing-telegraph receivers.

1,171,429. Telephone-Exchange System; C. L. Goodrun, New York, N. Y. App. filed July 23, 1915. Highly efficient repeater circuit.

1,171,460. Telephone Transmitter; S. C. Porter, New York, N. Y. App. filed June 12, 1915. Constructed to pick up sounds emanating from a distance.

1,171,471. Incandescent-Lamp Socket; M. V. Smith, Hartford, Conn. App. filed Oct. 17, 1914. Quickly attachable to wires.

1,171,494. Cut-out for an Electric Signal; G. L. Barrett, Springfield, Ohio. App. filed Sept. 6, 1913. Embodied in the case of a bell or buzzer.

1,171,518. Safety-Control System for Elevator Cars; H. G. Hillman and S. M. Ward, Jr., Morris Park and New York, N. Y. App. filed Aug. 2, 1910. Landing doors held latched until car reaches landing.

1,171,520. Calling Device; H. Hovland, East Orange, N. J. App. filed Feb. 12, 1915. For automatic telephone systems.

1,171,564. Thermally Operated Means for Automatically Disrupting Electric Alarm Circuits, etc.; H. S. Turner, San Diego, Cal. App. filed Sept. 18, 1914. Strand which is sensitive to heat.

1,171,576. Interrupter; T. Abtmeyer, Wilkinsburg, Pa. App. filed Aug. 11, 1913. For ignition systems.

1,171,577. Interrupter; T. Abtmeyer, Wilkinsburg, Pa. App. filed Sept. 10, 1914. Has condenser combined with it.

1,171,586. Meter Switch; H. W. Brown, Wilkinsburg, Pa. App. filed June 28, 1911. For changing the connections for a single ammeter.

1,171,587. Switch for Meters; H. W. Brown, Wilkinsburg, Pa. App. filed June 28, 1911. Enables ammeter to be associated with any phase of a polyphase circuit.

1,171,588. Metering Switch; H. W. Brown, Wilkinsburg, Pa. App. filed June 28, 1911. Protected against being coupled to more than one phase or circuit at the same time.

1,171,591. Coil for Electrical Apparatus; L. W. Chubb, Edgewood Park, Pa. App. filed Feb. 16, 1912. Terminal for coils of aluminum conductors.

1,171,595. Vehicle Lighting System; F. Conrad, Swissvale, Pa. App. filed Jan. 10, 1912. Prevents application of excessive voltage to lamps.

1,171,596. Interrupter; F. Conrad, Pittsburgh, and T. Abtmeyer, Wilkinsburg, Pa. App. filed May 11, 1914. Arranged to prevent "back-firing."

1,171,597. Storage-Battery Separator; J. N. Davis, Denver, Col. App. filed Sept. 21, 1914. Envelope of corrugated construction.

1,171,598. Spark-Gap for Radiatone Wireless-Telegraph Systems; L. De Forest, New York, N. Y. App. filed March 10, 1910. Plurality of metal disks with interposed compressible varnished fabric.

1,171,600. Electric Locomotive; G. M. Eaton, Wilkinsburg, Pa. App. filed June 28, 1913. Rigid-pedestal structure.

1,171,629. Circuit Closer; S. Meyers, Tower, Mich. App. filed June 7, 1915. Constructed to prevent unauthorized closing of ignition circuit.

1,171,630. Brush Connection; J. Naydor, Lakewood, Ohio. App. filed March 12, 1915. End of stranded conductor is wadded and spun into compact mass in recess in carbon brush.

1,171,633. Sound-Absorbing Device; E. Osborn and J. J. Nolan, Albany, N. Y. App. filed Feb. 13, 1915. Telephone transmitters.

1,171,635. Starting Synchronous Electric Machines; A. B. Owen, Ridgway, Pa. App. filed Sept. 27, 1913. Field is made to place itself in proper relation to armature current at synchronous speed.

1,171,668. Pianoforte Control; M. L. Severy, Arlington Heights, Mass., and G. B. Sinclair, Georgetown, Me. App. filed March 8, 1913. Means for varying loudness of vibrations of strings.

1,171,710. Attaching Device for Connecting Electric Lamps to Current-Carrying Conductors; M. H. Freixas, New York, N. Y. App. filed July 2, 1915. Socket which can be quickly clamped to electric wires.

Record of Electrical Patents

Notes on United States Patents issued Feb. 15, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,171,745. Telephone Attachment; G. P. Mundy, Washington, D. C. App. filed March 6, 1915. Reel for the cord in base of telephone.

1,171,756. Lock Circuit Closer; L. Souliere, Detroit, Mich. App. filed Feb. 11, 1915. To prevent the stealing of automobiles.

1,171,770. Signal Apparatus; R. B. Carter, Bloomington, Ind. App. filed June 7, 1913. Burglar alarm and fire alarm connected with the telephone circuit.

1,171,782. Method for the Hydro-Electrolytic Treatment of Ores; R. R. Goodrich, Tucson, Ariz. App. filed May 25, 1915. Metal contents of electrolyte and current density substantially constant at each step.

1,171,813. Multiplex Telegraphy; F. K. Vreeland, Montclair, N. J. App. filed Jan. 8, 1910. Number of alternating currents of different frequencies simultaneously impressed upon a common line.

1,171,814. Multiplex Telegraphy; F. K. Vreeland, Montclair, N. J. App. filed June 4, 1913. Employs a single transformer of unequal windings.

1,171,819. Process of Making Electroplates; A. R. Warren, Chicago, Ill. App. filed Sept. 8, 1914. Edges of plate are beveled and coppered.

1,171,822. Autographic Telegraphy; E. H. and K. A. Widegren, Alby, Sweden. App. filed Dec. 20, 1913. Duplex action.

1,171,832. Method of Treating Metals; F. L. Bishop, Pittsburgh, Pa. App. filed Feb. 26, 1913. Metal subjected to magnetic field of an alternating current.

1,171,851. Attachment Plug for Electrical Conductors; C. J. Klein, Milwaukee, Wis. App. filed Jan. 13, 1913. Made in two parts held together by a screw shell.

1,171,852. Attachment Plug; C. J. Klein, Milwaukee, Wis. App. filed Oct. 28, 1913. Parts automatically lock together upon partial assembly.

1,171,860. Process of Making Insulating Joints; L. McCarthy, Boston, Mass. App. filed June 1, 1914. Uses a tube of mica within a steel shell.

1,171,864. Electric Switch; E. B. Merriam, Schenectady, N. Y. App. filed June 23, 1911. Oil-switch construction.

1,171,890. Contactor; J. J. Ruddick, Newton, Mass. App. filed April 22, 1915. For block-signal systems of trolley roads.

1,171,907. Electrical Measuring Instrument; H. E. Trent, Wilkinsburg, Pa. App. filed Nov. 16, 1914. Ohmmeter having large range of deflection.

1,171,914. Receptacle and Plug; G. Wright, Pittsfield, Mass. App. filed Aug. 13, 1906. Wall plug of pleasing appearance.

1,171,915. Electric-Train Bulletin Board; C. E. Abernethy, Hickory, N. C. App. filed Dec. 4, 1914. Bulletin clocks controlled by manually operated master clock.

1,171,929. Water Heater; A. S. Cubitt, Pittsfield, Mass. App. filed Nov. 26, 1910. Flow of water is controlled by the temperature to which the water is raised.

1,171,936. Means for Preventing Corona Losses; G. Faccioli, Pittsfield, Mass. App. filed April 27, 1911. Conductor with plurality of enlargements with surfaces curved to prevent corona.

1,171,945. Regulating Mechanism for Arc Lamps; J. L. Hall, Schenectady, N. Y. App. filed April 11, 1913. A motor feeds the electrodes together and apart.

1,171,948. Self-Starter for Engines; R. H. Hassler, Indianapolis, Ind. App. filed Nov. 23, 1912. Motor-generator which is mounted on the engine shaft without taking up extra room.

1,171,964. Electric Motor; N. O. Lindstrom, Nutley, N. J. App. filed Aug. 1, 1914. Particularly for hoisting purposes.

1,171,969. Electrolytic Rectifier; R. D. Mershon, New York, N. Y. App. filed Jan. 23, 1912. Has thorough and rapid circulation for electrolyte.

1,171,972. Magnetic Means for Moving Miniature Boats; L. E. Myers, Chicago, Ill. App. filed June 12, 1915. Used on the miniature Panama Canal at San Francisco Exposition.

1,171,987. Rotary Snap Switch; J. S. Stewart, New York, N. Y. App. filed Dec. 2, 1913. Pull-socket construction.

1,171,991. Locking System for Railway Switches; E. W. Vogel, Chicago, Ill. App. filed Feb. 19, 1908. Electrically controlled switch lock acting also as circuit maker and breaker.

1,171,997. Electric Burglar-Alarm System; J. P. Williams, New York, N. Y. App. filed May 21, 1910. Failure of part initially subject to attack automatically throws into operation parts liable to subsequent attack.

1,172,006. Circuit-Reversing Drum for Signal Mechanism; R. and J. W. Cairns, Watertown, Wis. App. filed June 19, 1914. Especially for railway-crossing signals.

1,172,015. Interrupter; J. B. Dyer, Racine, Wis. App. filed May 14, 1915. Noiseless in operation.

1,172,017. Method of Transmitting Energy by Electromagnetic Waves; R. A. Fessenden, Washington, D. C. App. filed May 12, 1906. Commutates the source of energy.

1,172,018. Electromagnetic Indicator; R. A. Fessenden, Brant Rock, Mass. App. filed March 14, 1908. Particularly sensitive and reliable.

1,172,019. Safety-Switch Panel; A. E. Griswold, Seattle, Wash. App. filed Jan. 21, 1915. Multiple-switch panel allowing removal of safety cover without affecting switches.

1,172,024. Electrically Heated Laundry Iron and Like Apparatus; J. G. Homan, Steubenville, Ohio. App. filed June 25, 1915. Has a conveniently "mailable" transportable heating element.

1,172,025. Electric Heating Device; J. G. Homan, Steubenville, Ohio. App. filed Oct. 2, 1915. Pad construction.

1,172,047. Ball-Rolling Contact for Rain Signals, Etc.; W. E. R. Rademaker, Hoboken, N. J. App. filed June 29, 1915. Dust-proof and rust-proof.

1,172,078. Combined Fishplate, Bond and Protector; L. D. Vaughn and W. P. Samples, Grafton, W. Va. App. filed May 22, 1915. Ends of bonds extend through the fishplates.

1,172,080. Means for Closing and Opening Electric Circuits; H. Voigt, Nonneddamm, near Berlin, Germany. App. filed March 28, 1913. For automatically controlling circuits for operating bells, etc.

1,172,083. Warning-Signal Means for Garages; T. D. Warner, Jonesboro, Ark. App. filed March 17, 1915. Warns passing pedestrians of car leaving garage.

1,172,084. Electrically Operated Warning-Signal Means for Garages; T. D. Warner, Jonesboro, Ark. App. filed March 18, 1915. Operated by car leaving garage.

1,172,147. Protecting Device for Electric Conductors; M. H. Loughridge, New York, N. Y. App. filed Aug. 18, 1911. Shield for the end of the conductor where it rises from conduit.

1,172,169. Electrically Operated Tool; F. Schneider, Cleveland, Ohio. App filed Feb. 20, 1913. Drill with means to prevent escape of lubricants.

1,172,173. Timer for Internal-Combustion Engines; T. B. Shryock, Lawrenceburg, Ky. App. filed March 27, 1915. Protected against dirt, etc.

1,172,178. Switch for Electroliers; T. C. Strout, Waterbury, Conn. App. filed June 28, 1912. Push-button construction.

1,172,199. Alarm Apparatus; W. H. Dana and T. F. Broderick, Lawrence, Mass. App. filed May 25, 1915. For automatic sprinkler systems of the dry type.

1,172,203. Magnetic Lock; P. W. Fuller, Boston, Mass. App. filed June 19, 1914. Key of magnetic material reduces gap in the magnetic field.

1,172,221. System of Electrical Distribution and Control; F. B. MacNab, Dayton, Ohio. App. filed Dec. 26, 1912. For engine starting and ignition purposes.

14,062 (reissue). Alternating-Current Motor; D. M. Bliss, West Orange, N. J. App. filed Jan 10, 1916. (Original patent No. 1,126,363, dated Jan. 26, 1915.) Simple, self-starting synchronous motor.